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AN ANALYSIS OF THE DIMENSIONS OF PRODUCTIVITY OF THE U.S. AUTOMOBILE INDUSTRY AND SOME EXPLANATIONS

February 1982 1274-82

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AN ANALYSIS OF THE DIMENSIONS OF PRODUCTIVITY OF THE U.S. AUTOMOBILE INDUSTRY AND SOME EXPLANATIONS

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February 1982

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I. INTRODUCTION

We have extensively discussed various productivity measures in Working Paper SSM #1251-81 and Working Paper SSM #1234-82. We have deduced that only value added of output(s) over value of input(s) measures fulfill for the most part the criteria of homogeneity, robustness, validity, practicality and utilization.

As we have pointed out in Working Paper SSM#1234-82, our statistical tests using the automobile industry as our empirical domain showed that the time series of the value added over payroll and benefits measure of productivity generally exhibited superior performance. In a few cases that value added over payroll and benefits was not the best measure, it performed very closely to the best measure (value added over operating costs and depreciation or capital expenditure), according to our test.

However, there is a fundamental reason which dictates the eventual adoption of the value added over payroll and benefits measure as the most meaningful measure of productivity. The reason is that for our strategic approach to industry analysis a meaningful measure of productivity should not only describe the productivity of a firm absolutely but also relatively to its degree of vertical integration.

The time series of value added over operating costs and capital expenditures (or depreciation) adequately describe absolute productivity but are deficient in describing relative productivity because the denominator (operating costs) is dependent upon the varying degree of vertical integration from one particular firm to another. In our estimation this is a very important point because the changes in vertical integration over the years, implemented either by conscious strategic planning or enforced by external

economic/political influences greatly affects the relative measurement of productivity among firms and can even mislead the uninitiated analyst.

Since we have chosen the U.S. Automobile industry as our domain for the empirical application of our theoretical concepts, we present in Figure 1(a,b) the time series of value added over sales for General Motors and Ford as a proxy measure of vertical integration for these two firms. We observe that the degree of vertical integration for General Motors has declined significantly from 1963 and for Ford from 1960 onwards. That means that the ratio of the value of materials purchased from vendors over sales kept increasing. Complexity of operations and/or higher wages are the only plausible explanation for the decline of value added over sales.

Besides the conventional measure of vertical integration shown in Figure 1(a,b), we present in Figure 1(c,d) an alternative measure of vertical integration, namely value added to cost of goods sold over cost of goods sold. The value added over sales measure of vertical integration includes market power aberrations reflected in sales, which the latter measure avoids. We observe in Figure 1(c,d) that the degree of vertical integration for General Motors has declined significantly from 1961 and for Ford from 1960 onwards. Since both firms kept increasing their purchased materials from vendors, we may hypothesize that the industry experienced increased complexity of operations and/or higher wages.

It should be noted that both measures exhibit the same relative decline which further enhances our conclusion about the decline of vertical integration.

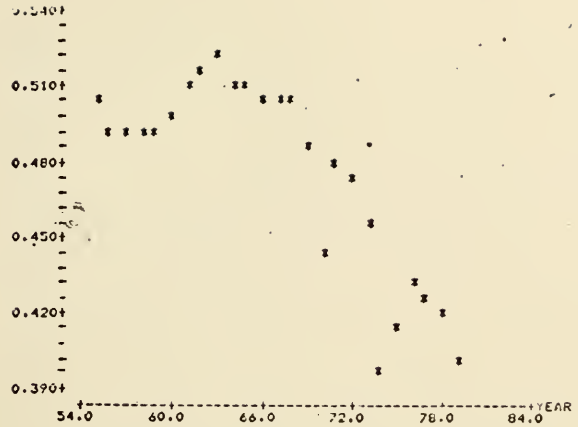

Figure 1(a):

Value Added over Sales (GM)

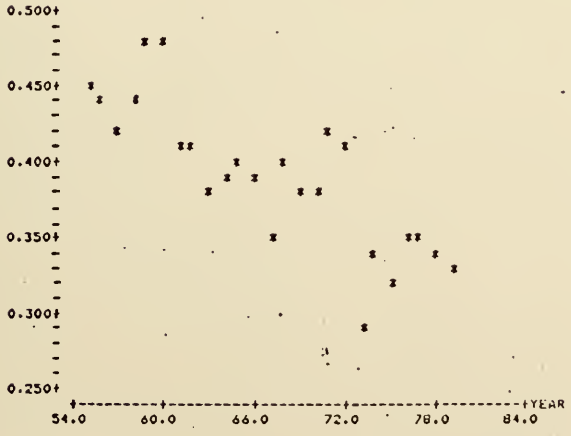

Figure 1(b):

Value Added over Sales (Ford)

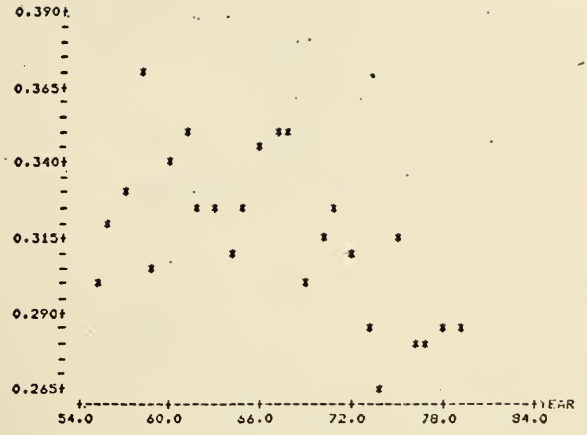

Figure 1(c):

Value Added of Cost of Goods Sold over Cost of Goods Sold (GM)

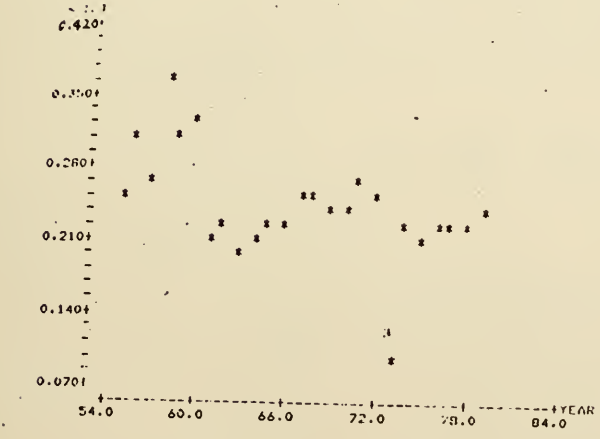

Figure 1(d):

Value Added of Cost of Goods Sold over Cost of Goods Sold (Ford)

II. DIMENSIONS OF PRODUCTIVITY

A. Theoretical Definition of Average and Marginal Productivity

Value added for year t has been defined in Working Paper SSM 1234-82 as revenues adjusted for increases/decreases in inventory costs minus cost of materials, or

$$VA_t = NS_t^{adj} - M_t \qquad (1)$$

where

VA_t = Value Added in year t

NS_{adj}^t = Revenues adjusted for inventory cost in year t

M_t = Cost of materials in year t

Operating profit can be defined as revenues adjusted for increases/decreases in inventory costs minus cost of labor (approximated in our case by payroll and benefits) minus cost of capital (approximated in our case by depreciation) minus cost of materials, or

$$OP_t = NS_t^{adj} - PB_t - D_t - M_t \qquad (2)$$

where

OP_t = Operating Profit in year t

NS_t^{adj} = Revenues adjusted for inventory cost in year t

PB_t = Payroll and Benefits in year t

D_t = Depreciation in year t

M_t = Cost of Materials in year t

Combining equations (1) and (2) we get the average productivity equation,

$$VA_t = PB_t + D_t + OP_t \qquad (3)$$

or

$$\frac{VA}{PB_t} = 1 + \frac{D}{PB_t} + \frac{OP}{PB_t} \qquad (4)$$

It follows from the above analysis that the change of productivity over time can be given by the marginal productivity equation.

$$\frac{VA}{PB}_{t+1} - \frac{VA}{PB}_{t} - \frac{D}{PB}_{t+1} + \frac{D}{PB}_{t} - \frac{OP}{PB}_{t+1} + \frac{OP}{PB}_{t} = 0 \qquad (5)$$

The possible combinations for change in productivity and its dimensions are given in Table 1. For example, Case a depicts the possibility that all three ratios (value added over payroll and benefits, depreciation over payroll and benefits and operating profits over payroll and benefits) increase over time; Case b depicts a positive change in value added over payroll and benefits and operating profits over payroll and benefits and a negative change in depreciation over payroll and benefits. The rest of the Cases follow by simple permutation.

The six cases presented in Table 2 cover exhaustively all potential changes in the percentage contributions of the dimensions of value added. Assuming that such changes occur randomly, the ex

ante probability that each of the above six cases will happen is 1/6. Any statistically significant deviation from the probability of 1/6, refutes the null hypothesis of random occurence or "random walk" and poses the possibility of another causal factor explaining the phenomenon.

Change in (from t to t+1)	Sign of Changes in Ratios					
	Case a	Case b	Case c	Case d	Case e	Case f
$\frac{VA}{PB}$	+	+	+	-	-	-
$\frac{D}{PB}$	+	-	+	-	-	+
$\frac{OP}{PB}$	+	+	-	-	+	-
Probability	1/6	1/6	1/6	1/6	1/6	1/6

Note: Changes of zero magnitude have an ex ante zero probability of occurence.

Table I

B. Empirical Application of Average Productivity Equation

In Working Paper SSM 1234-82 we have presented the time series of the value added over payroll and benefits . In Figures 2 and 3 we present the time series of a) value added, b) depreciation and c) operating profits over payroll and benefits for General Motors and Ford respectively. This time series analyses, based on Equation (4), allows us to compare the behavior of our average productivity measure, namely value added over payroll and benefits, with the behavior of its dimensions, namely depreciation and operating profits over payroll and benefits.

We observe in Figures 2(a), 3(a) that our measure of average productivity, value added over payroll and benefits, is clearly declining. It should be noted that General Motors average productivity started declining in 1963 and Fords' in 1962. Our measure has also captured shocks such as strickes (1970 for General Motors, 1967 for Ford) and energy price increases (1974, 1979 for General Motors and 1973, 1979 for Ford subject to their accounting policies), which resulted in low outliers because of their negative impact on value added.

The dimensions of productivity offer another view of the dramatic decline experienced by GM and Ford in the past fifteen years. Depreciation and operating profits over payroll and benefits are consistently declining for both General Motors and Ford.

Since the depreciation measure in Figures 2(b), 3(b) is a mixture of previous and current investments, we examined the ratio of depreciation over payroll and benefits in constant dollars discounted by the Consumers Price Index (CPI). We observe that this ratio is increasing, which indicates that the "true" behavior of the consumption of capital as a fraction of payroll and benefits is an intermediate case between the extreme cases depicted in Figures 2(b), 2(c) and 3(b), 3(c). We tend, however, to hyothesize that a gently declining pattern represents reality more closely, because the pattern of capital expenditures over payroll and benefits (current, lagged or led by one year) is also declining, as shown in Figures 2(d,e,f) and 3(d,e,f).

The operating profits over payroll and benefits measure has also captured the shocks from strikes and energy price hikes, as shown in Figures 2(g), 3(g). Later we will examine the relative growth of the various components of value added and hence show more explicitly the

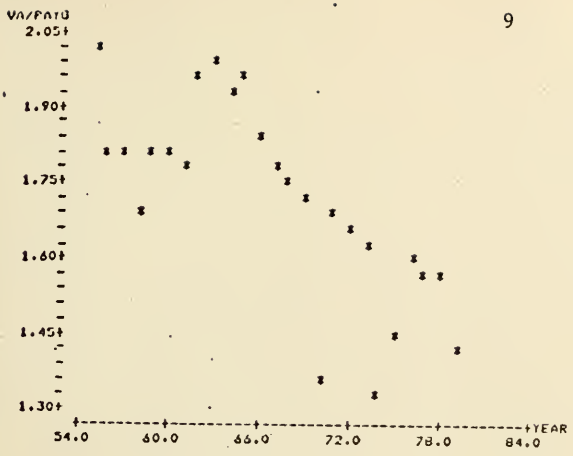

Figure 2(a):

Value Added over Payroll and Benefits (GM)

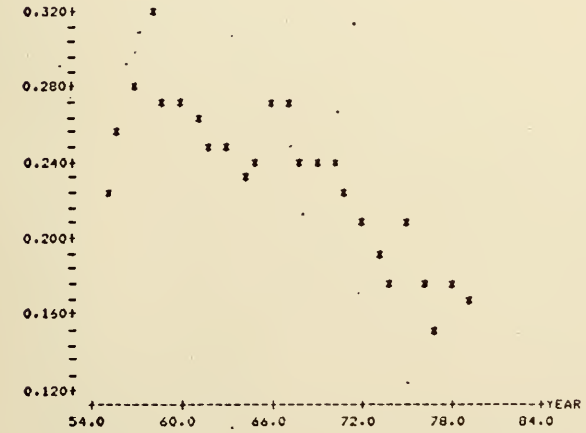

Figure 2(b):

Depreciation over Payroll and Benefits (GM)

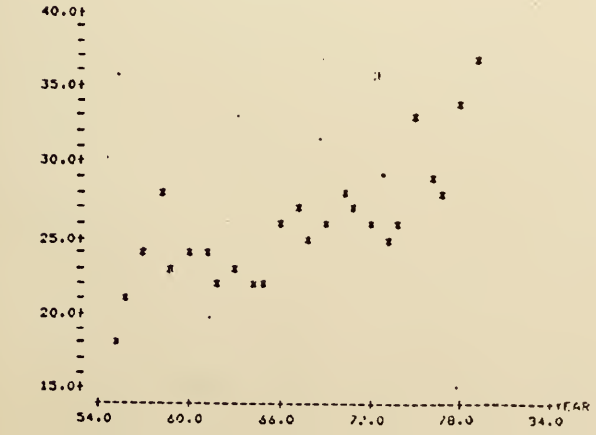

Figure 2(c):

Depreciation over Payroll and Benefits in Constant Dollars (GM)

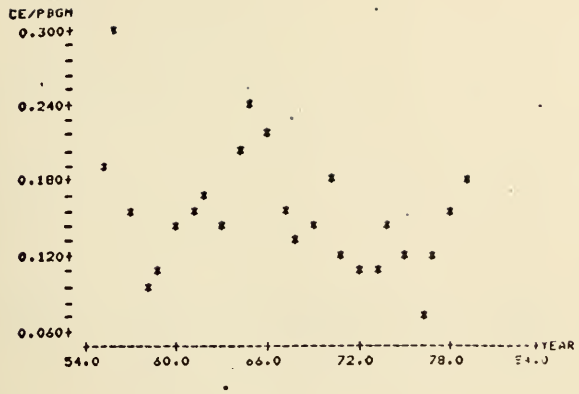

Figure 2(d):

Capital Expenditures (Current Year
over Payroll and Benefits (GM)

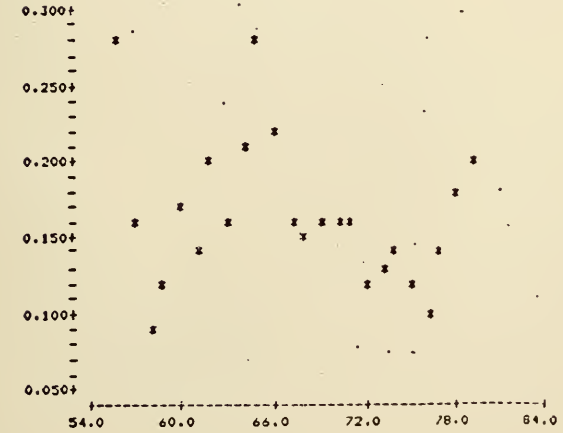

Figure 2(e):

Capital Expenditures (One Year Lag
over Payroll and Benefits (GM)

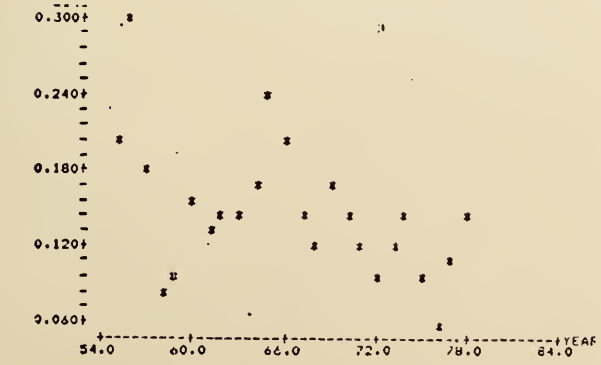

Figure 2(f):

Capital Expenditures (One Year Lag
over Payroll and Benefits (GM)

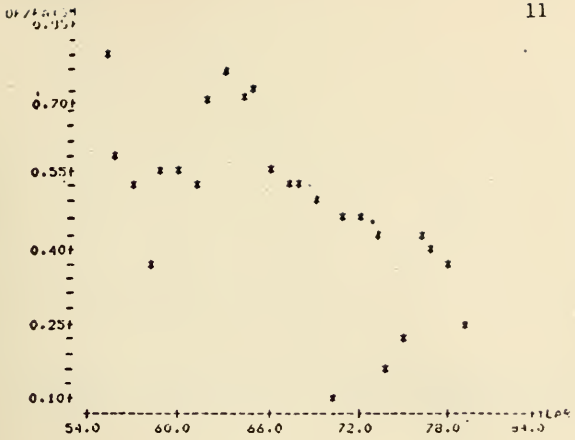

Figure 2(g):

Operating Profits over Payroll and Benefits (GM)

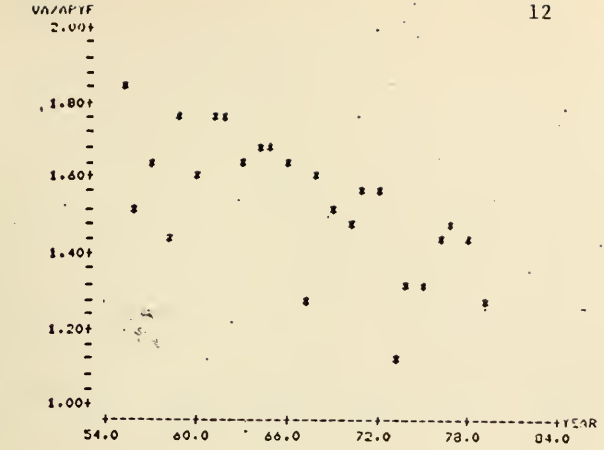

Figure 3(a):

Value Added over Payroll and Benefits (Ford)

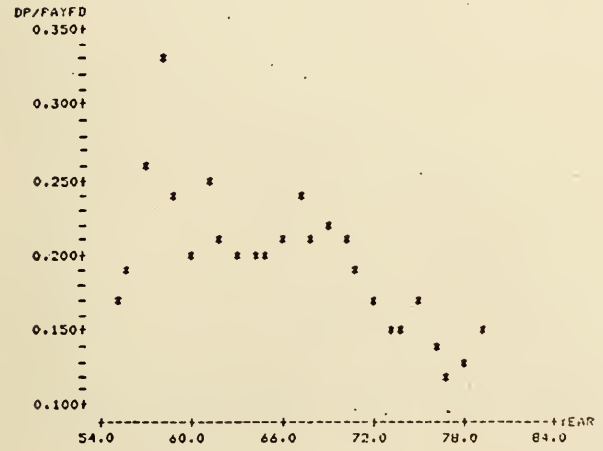

Figure 3(b):

Depreciation over Payroll and Benefits (Ford)

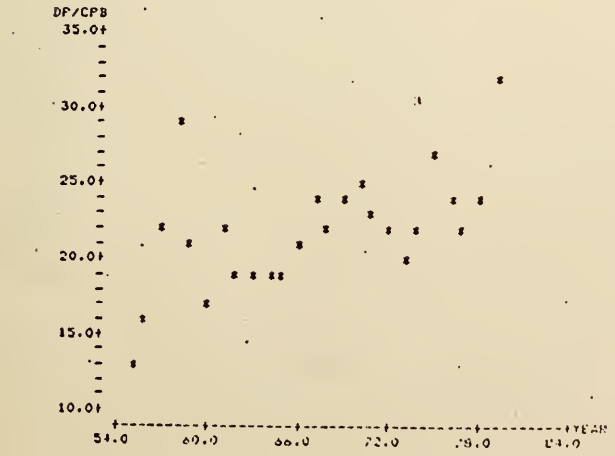

Figure 3(c):

Depreciation over Payroll and Benefits in Constant Dollars (Ford)

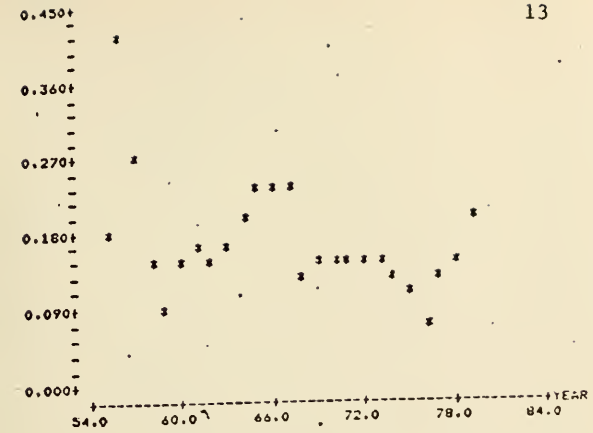

Figure 3(d):

Capital Expenditures (Current Year) over Payroll and Benefits (Ford)

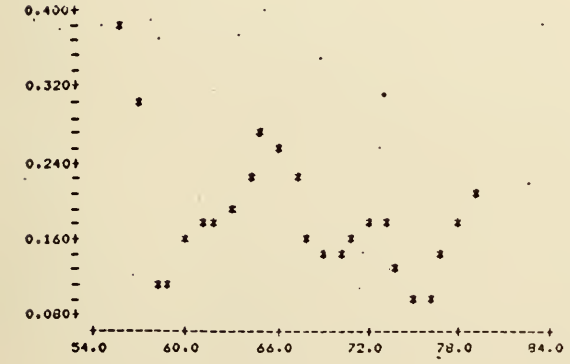

Figure 3(e):

Capital Expenditures (One Year Lag) over Payroll and Benefits (Ford)

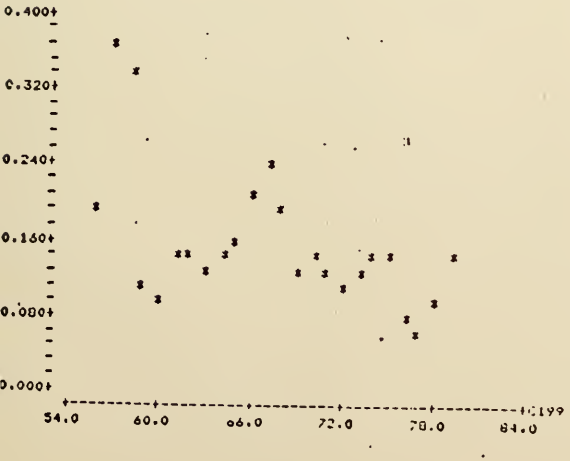

Figure 3(f):

Capital Expenditures (One Year Lead) over Payroll and Benefits (Ford)

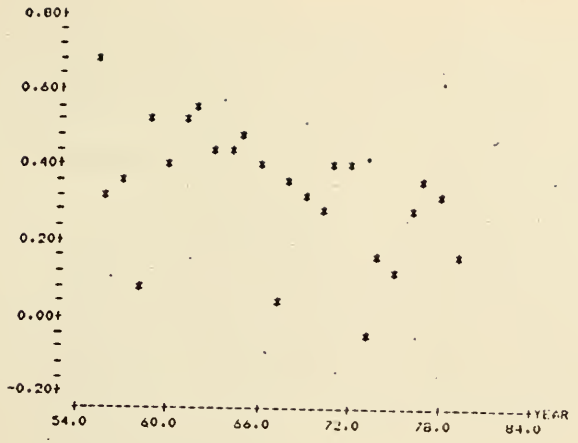

Figure 3 (c):

Operating Profits over Payroll and Benefits (Ford)

conclusions that are deduced from Figures 2 and 3. However, we can already discern that the rate of increase of payroll and benefits exceeded the rate of change of the other components of productivity.

Finally, we observe that the approximate percentage increases (decreases) of our productivity measure and its dimensions in nominal dollars, for both General Motors and Ford are approximately 25%, (30%) and (65%) in the past fifteen years. We can thus deduce that the increase of payroll and benefits primarily happened at the expense of operating profits.

C. Empirical Application of Marginal Productivity Equation

In Figures 4 and 5 we present the time series of yearly change in value added, depreciation and operating profit each divided by payroll and benefits for General Motors and Ford respectively. This time series analysis, based on Equation (5), allows us to compare the behavior of our marginal productivity measure, namely change over time of value added over payroll and benefits, with the behavior of its dimensions, namely change over time of depreciation and operating profits over payroll and benefits.

We observe that the changes over time in value added, depreciation and operating profit over payroll and benefits for General Motors and Ford present a pattern clearly deviating from a uniform "random walk", given that the probability of a negative change in value added over payroll and benefits is approximately 70%. Hence, we refute the null hypothesis of a purely random movement of changes in productivity and its dimensions and recognize the need for a causal diagnosis of the phenomenon.

Value Added	Depreciation	Operating Profits
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

<u>Figure 4:</u>

Time Series of Change Value Added, Depreciation and Operating Profits over Payroll and Benefits (GM)

Value Added	Depreciation	Operating Profits
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

<u>Figure 5:</u>

Time Series of Change Value Added, Depreciation and Operating Profits over Payroll and Benefits (Ford)

III. DIMENSIONS OF VALUE ADDED

A. Theoretical Definitions

All meaningful measures of productivity use value added as their numerator, as explained in Working Papers SSM #1251-81 and SSM #1234-82. In our research we have proved the supremacy of value added over payroll and benefits measure, at least in the case of the automobile industry. In any case, however, it is theoretically and empirically necessary to analyze the dimensions of value added in order to shed more light to the behavior of the numerator of productivity measures.

It follows from Equation (3) that the dimensions of value added are payroll and benefits, depreciation and operating profits. Hence,

$$\frac{PB_t}{VA_t} + \frac{D_t}{VA_t} + \frac{OP_t}{VA_t} = 1 \qquad (6)$$

Equation (6), which follows from the definition of value added, traces over time the percentage contribution of the dimensions of value added. The change over time of the percentage contributions of the dimenions of value added is given by

$$\frac{PB_{t+1}}{VA_{t+1}} - \frac{PB_t}{VA_t} + \frac{D_{t+1}}{VA_{t+1}} - \frac{D_t}{VA_t} - \frac{OP_{t+1}}{VA_{t+1}} - \frac{OP_t}{VA_t} = 0 \qquad (7)$$

The possible combinations for change of the percentages are given in Table 2, constructed similarly to Table 1.

Change in (from t to t+1)	Sign of Changes in Ratios					
	Case a	Case b	Case c	Case d	Case e	Case f
$\frac{PB}{VA}$	+	+	+	-	-	-
$\frac{D}{VA}$	+	-	-	+	+	-
$\frac{OP}{VA}$	-	+	-	+	-	+
Probability	1/6	1/6	1/6	1/6	1/6	1/6

Note: Changes of zero magnitude have an ex ante zero probability of occurence.

Table 2

Although the changes in the percentage contribution of the dimensions of value added explain their relative significance in the composition of value added, a more detailed analysis is necessary in order to examine the relative rate of change of these dimensions vis-a-vis value added. In order to measure this relative rate of change we employ Equation (3) and derive

$$\frac{PB_{t+1}}{VA_{t+1}} - \frac{PB_t}{VA_t} + \frac{D_{t+1}}{VA_{t+1}} - \frac{D_t}{VA_t} + \frac{OP_{t+1}}{VA_{t+1}} - \frac{OP_t}{VA_t} = 1 \qquad (8)$$

Each term of Equation (8) gives over time the relative change of the dimensions of value added vs. the change in value added. We present the possible combinations for change of the dimensions in Table 3, constructed similarly to Table 1.

Change in (from t to t+1)	Sign of Changes in Ratios					
	Case a	Case b	Case c	Case d	Case e	Case f
VA	+	+	+	-	-	-
PB	+	+	+	+	+	+
O	-	+	-	-	+	-
Probability	1/6	1/6	1/6	1/6	1/6	1/6

Note: Changes of zero magnitude have an ex ante zero probability of occurence.

Table 3

We can again check the null hypothesis of random occurence and consequently of probability 1/6 and also examine, in case of significant deviation, the possibility of some causal factor explaining the phenomenon.

An alternative presentation of relative rates of changes can be done by using value-added "elasticities" of the dimensions of value added. The sole purpose of this alternative representation is to put relative changes in terms of familiar percentage change ratios, or

$$e_t^{PDV} = \frac{PB_{t+1} - PB_t}{VA_{t+1} - VA_t} \cdot \frac{VA_t}{PB_t} \qquad (9a)$$

$$e_t^{DV} = \frac{D_{t+1} - D_t}{VA_{t+1} - VA_t} \cdot \frac{VA_t}{D_t} \qquad (9b)$$

$$e_t^{OPV} = \frac{OP_{t+1} - OP_t}{VA_{t+1} - VA_t} \cdot \frac{VA_t}{OP_t} \qquad (9c)$$

B. Empirical Application of Percentage Contribution Equation

Using the U.S. Automobile industry as our empirical domain we will test the hypotheses raised in the previous section. We present in Figures 6 and 7 the time series of the percentage contributions of the dimensions of value added for General Motors and Ford respectively.

We observe in Figures 6(a), 7(a) that the percentage contribution of payroll and benefits to value added (inverse of our productivity measure) is obviously increasing. We note again the existence of outliers, for both General Motors and Ford, due to strikes (1967 and 1970) and energy price increases (1973-74 and 1979).

We can hypothesize that the growth rate of payroll and benefits is greater than the growth rate of value added. We will test whether the difference in growth rates is statistically significant. We test this hypothesis by separately regressing the index of payroll and benefits and the index of value added over time. Then, we test whether the coefficients of time in two regressions are significantly different.

The regressions are the following:

$$PB(GM) = -18.3 + 0.182t \quad (s.d. = 0.01644)$$

$$VA(GM) = -12.4 + 0.126t \quad (s.d. = 0.012520)$$

$$PB(FORD) = -26.2 + 0.257t \quad (s.d. = 0.02233)$$

$$VA(FORD) = -18.5 + 0.184t \quad (s.d. = 0.01708)$$

The t-test shows that the coefficients of time for payroll and value added are significantly different for both firms. Actually the t-statistic is 13.17 for GM and 18.36 for Ford, meaning both are significantly at 0.01 level. Therefore, we conclude that for these two firms, payroll and benefits has increased significantly faster than value added.

The percentage contribution of depreciation to value added for General Motors shown in Figure 6(b), has been declining in two stages; from 1958 to 1965 and from 1966 to 1977 with a quantum leap from 1965 to 1966, while an upward trend started in 1978 reflecting increased capital spending. For Ford, the percentage contribution of depreciation to value added shown in Figure 7(b) has been rather stable and on the average slightly declining. An upward trend for Ford has also started in 1978. Since depreciation reflects a mixture of various vintages of capital, we also present the percentage contribution of depreciation to value added measured in constant dollars discounted by the New Car Price Index (NCPI) in Figures 6(c) and 7(c). We observe that the adjusted ratio behaves similarly to the unadjusted ratio. Furthermore we calculated the

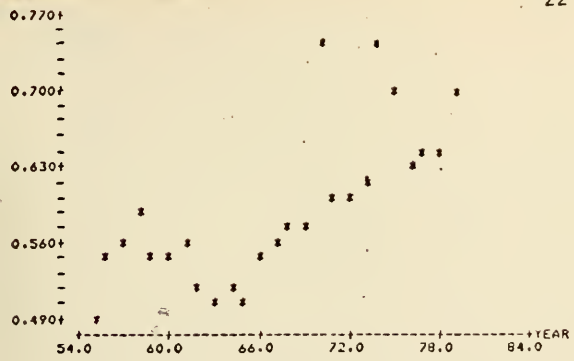


Figure 6(a):

Payroll and Benefits over Value Added (GM)

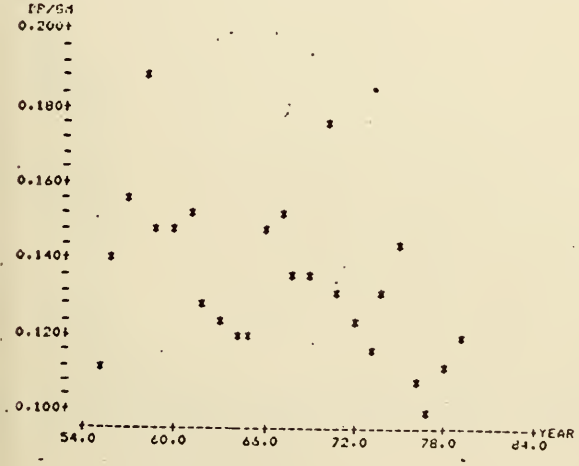


Figure 6(b):

Depreciation over Value Added (GM)

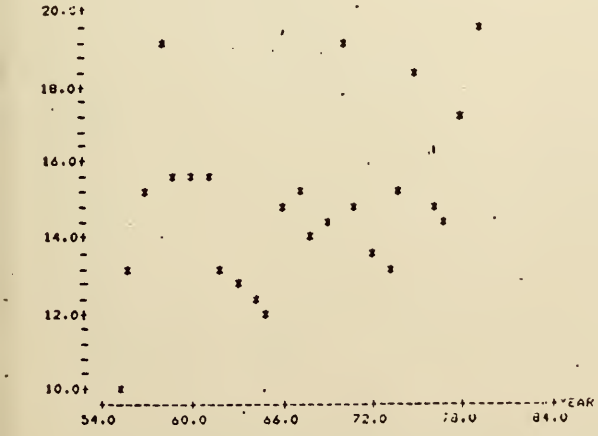


Figure 6(c):

Depreciation over Value Added in Constant Dollars (GM)

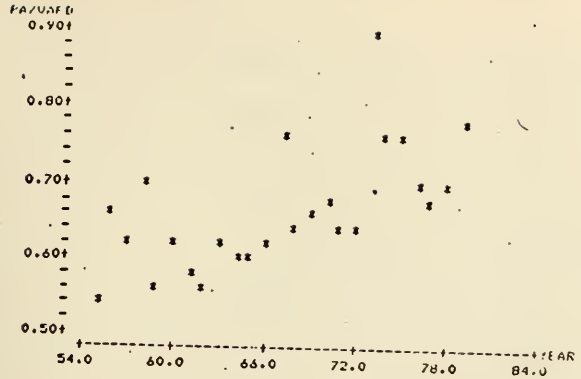


Figure 7(a):

Payroll and Benefits over Value Added (Ford)

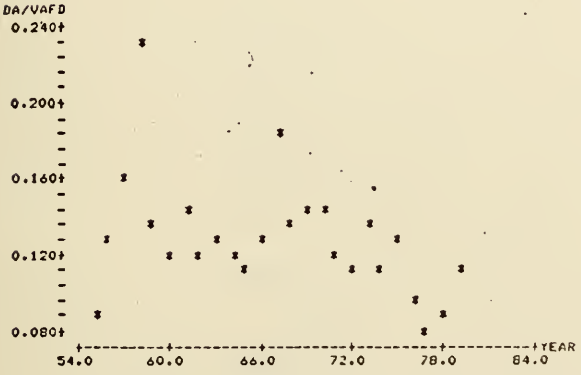


Figure 7(b):

Depreciation over Value Added (Ford)

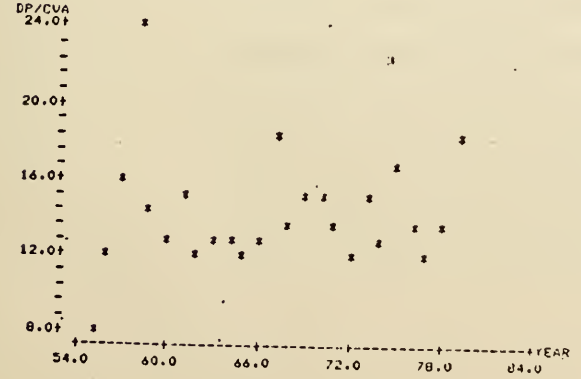


Figure 7(c):

Depreciation over Value Added in Constant Dollars (Ford)

ratios of capital expenditures to value added (current year and lagged by one year) in Figures 6(d,e) and 7(d,e). We observe for both General Motors and Ford a slightly declining or even stable pattern with an obvious upward trend in 1976-77.

The percentage contribution of operating profits to value added for both General Motors and Ford exhibits a four stage evolution. The percentages for GM shown in Figure 6(g), omitting the outliers, are approximately 30% from 1956 to 1961, 36% from 1962 to 1965, 28% from 1966 to 1973 and 20% from 1974 to 1979. The percentages for Ford shown in Figure 7(g), omitting again the outliers, are approximately 22% from 1956 to 1957, 28% from 1958 to 1966, 22% from 1968 to 1972 and 18% from 1973 to 1979. These movements show that the "good" years of growing profitability for the U.S. Automobile industry ended in the mid-sixties, which is consistent with the results of our productivity measure analysis..

Finally we observe that the approximate percentage increases (decreases) of the percentage contribution, of payroll and benefits, depreciation and operating profits value added for GM in the past fifteen years have been 40%, (8%) and (50%). The respective numbers for Ford in the same time period are 30%, (18%) and (67%). We therefore conclude that the increase of the percentage contribution of payroll and benefits to value added can be primarily explained by the decrease of the percentage contribution of operating profits to value added, because the change in the percentage contribution of depreciation to value added is relatively unimportant.

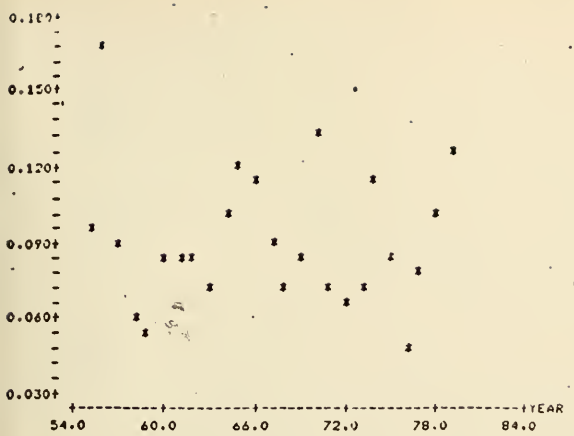


Figure 6(d):

Capital Expenditures (Current Year) over Value Added (GM)

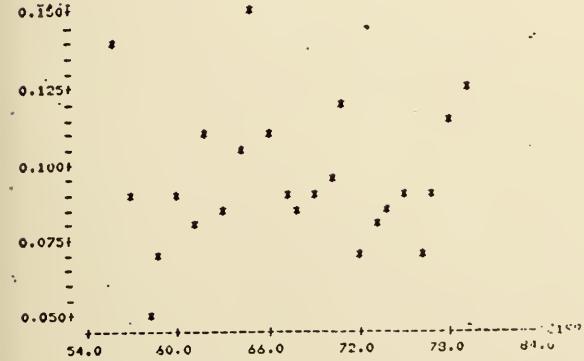


Figure 6(e):

Capital Expenditures (One Year Lag) over Value Added (GM)

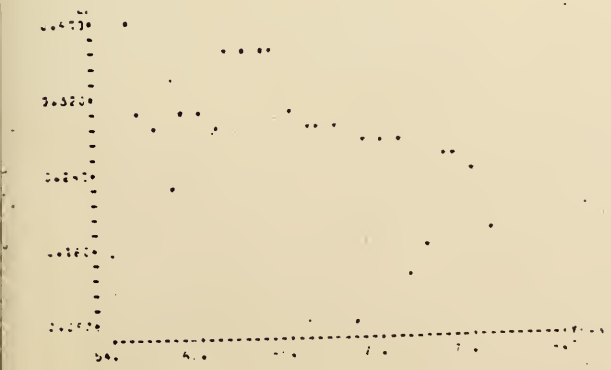


Figure 6(f):

Capital Expenditures (One Year Lead) over Value Added (GM)

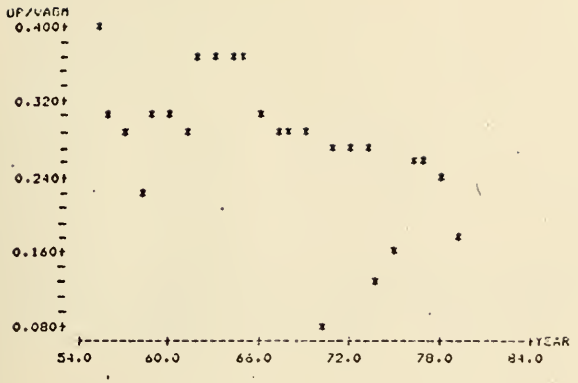


Figure 6(g):

Operating Profits over Value Added (GM)

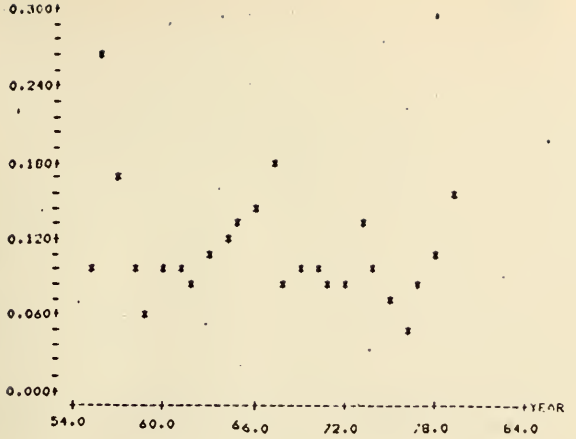


Figure 7(d):

Capital Expenditures (Current Year) over Value Added (Ford)

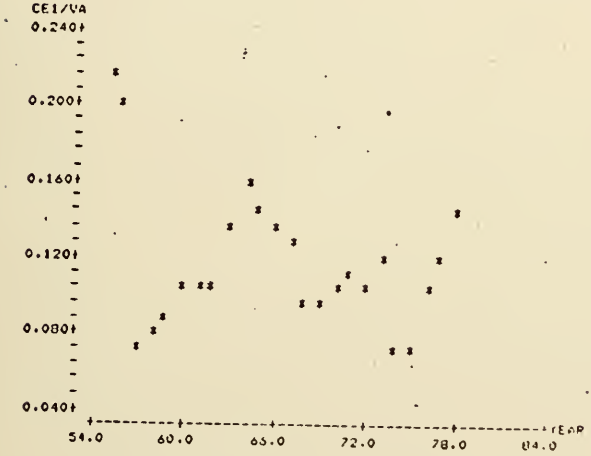


Figure 7(e):

Capital Expenditures (One Year Lag) over Value Added (Ford)

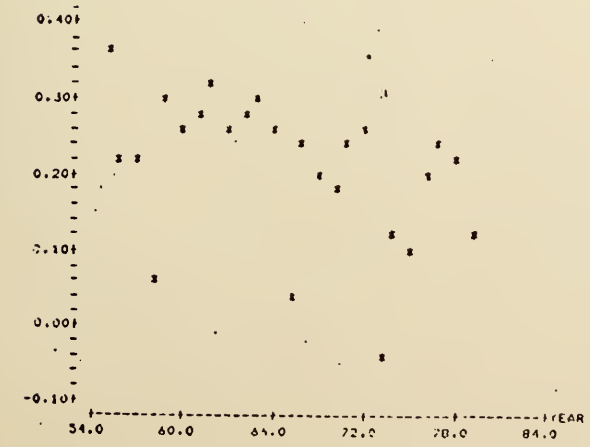


Figure 7(f):

Capital Expenditures (One Year Lead) over Value Added (Ford)

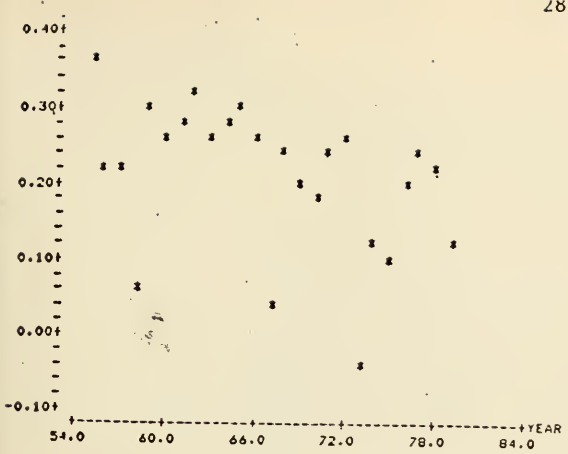


Figure 7(g):

Operating Profits over Value Added (Ford)

C. Empirical Application of Changes in Percentage Contribution Equation

In Figures 8 and 9 we present the time series of changes of the percentage contributions of value added for General Motors and Ford respectively.

We observe that the patterns of time series of changes of the percentage contribution of payroll and benefits (high probability of positive changes) and operating profits (high probability of negative change) to value added for General Motors and Ford, clearly deviate from a "random walk", whereas the test for depreciation is indecisive.

In Figures 10 and 11 we present the time series of the relative rates of change of the components of value added for General Motors and Ford respectively.

We observe that the relative rates of change of the components of value added do not follow any "random walk" pattern. Omitting outliers, the time series of the ratio of change in payroll and benefits over change in value added is predominantly positive and for both General Motors and Ford the ratio is on the average around 50%, which implies that changes are of the same sign and that payroll and benefits account on the average for 50% of this change. The time series of the ratio of change in depreciation over change in value added for both General Motors and Ford are predominantly positive and on the average around 7%. The same observation holds for operating profits change over value added change, namely the time series are predominantly positive; the average ratio is around 43%.

Payroll and Benefits	Depreci-ation	Operating Profits
0.053573	0.0301707	-0.044243
0.055926	0.0154359	-0.021862
0.053759	0.0428791	-0.071484
-0.046713	-0.0417481	0.064471
0.004546	0.0020399	-0.005486
0.011515	0.0023377	-0.014152
-0.051512	-0.0140110	0.076022
-0.012109	-0.0004203	0.014418
0.018054	-0.0024904	-0.015564
-0.008519	-0.0009031	0.009719
0.036973	0.0271632	-0.064126
0.013135	0.0093253	-0.022460
0.009044	-0.0162998	0.025555
0.010905	0.0011741	-0.012074
0.162946	0.0491103	-0.212056
-0.145751	-0.0452062	0.190957
0.001968	-0.0009478	0.002878
0.015376	-0.0045951	-0.019971
0.129511	0.0171694	-0.146771
-0.049568	0.0145461	0.035022
-0.067506	-0.0762975	0.143804
0.012027	-0.0055937	-0.017755
0.009252	0.0132615	-0.022544
0.061826	0.0057746	-0.067601

Figure 8:

Time Series of Changes of Percentage Contributions to Value Added (GM)

Payroll and Benefits	Depreci-ation	Operating Profits
0.111759	0.0346303	-0.146389
-0.040388	0.0329283	0.007460
0.087379	0.0742750	-0.161654
-0.136687	-0.0956154	0.232304
0.052631	-0.0165301	-0.036101
-0.049869	0.0212730	0.028611
-0.006646	-0.0241770	0.030823
0.047330	0.0085736	-0.056903
-0.009096	-0.0021580	0.011245
-0.011694	-0.0070040	0.018698
0.023249	0.0138548	-0.037104
0.156128	0.0540392	-0.210767
-0.137102	-0.0511979	0.188300
0.024091	0.0085460	-0.032637
0.017826	0.0018462	-0.019672
-0.038970	-0.0231237	0.062294
0.000376	-0.0103694	0.009994
0.264597	0.0265276	-0.291125
-0.139934	-0.0266043	0.166538
0.065005	0.0169462	-0.021954
-0.065916	-0.0277012	0.095497
-0.026470	-0.0164728	0.042943
0.026556	0.0050597	-0.031416
0.072425	0.0249546	-0.097379

Figure 9:

Time Series of Changes of Percentage Contributions to Value Added (Ford)

Payroll and Benefits	Depreciation	Operating Profits
0.2241	-0.04425	0.0799
1.1639	1.[illegible]277	-0.[illegible]395
0.3394	-0.[illegible]241	[illegible]
0.3459	-0.[illegible]231	0.[illegible]
0.5931	0.15[illegible]93	0.2519
0.4372	0.12174	0.4413
0.3541	0.05[illegible]89	0.5952
0.4094	0.13[illegible]83	0.4847
1.1774	0.00[illegible]31	-0.2284
0.4563	0.11652	0.4171
-0.1935	-0.3[illegible]477	1.[illegible]843
-0.6279	-0.37647	1.0563
0.6229	0.02059	0.3556
0.5593	0.15773	-0.0289
0.1986	0.[illegible]918	0.7576
0.3547	0.05756	0.5987
0.6230	-0.00389	0.3809
0.7369	0.04619	0.1758
0.1582	0.07505	0.7667
0.2037	0.28912	0.5072
0.4719	0.02413	0.5039
0.7206	0.04379	0.2356
0.6437	0.21993	0.1374

Figure 10:

Time Series of Relative Rates of Change of Percentage Contributions to Value Added (GM)

Payroll and Benefits	Depreciation	Operating Profits
0.1119	-0.04257	0.[illegible]37
0.3752	0.[illegible]5372	0.[illegible]1
0.4001	-0.02[illegible]	0.[illegible]
0.3029	-0.04719	0.7[illegible]
-1.0190	0.[illegible]1319	1.[illegible]
0.3246	0.[illegible]7552	0.[illegible]1
0.5328	0.[illegible]0437	0.[illegible]
16.[illegible]675	2.77178	-17.[illegible]
0.3416	0.1[illegible]955	0.[illegible]
0.5341	0.[illegible]0033	0.[illegible]
1.2733	0.[illegible]0278	-0.[illegible]
0.1556	-0.0[illegible]007	0.[illegible]
0.3746	0.[illegible]0737	0.[illegible]
0.1674	1.[illegible]525	-0.[illegible]
0.2277	0.[illegible]1462	-0.[illegible]
0.4759	0.[illegible]0009	0.[illegible]
0.6376	0.[illegible]5139	0.[illegible]
-0.[illegible]59	-0.[illegible]391	1.[illegible]
[illegible]790	-0.[illegible]1794	[illegible]
0.6454	-0.[illegible]7751	0.[illegible]
0.3415	0.[illegible]1[illegible]7	0.[illegible]
0.5[illegible]2	0.[illegible]1[illegible]75	0.[illegible]
0.[illegible]451	0.[illegible]1[illegible]18	[illegible]
[illegible]	[illegible]	[illegible]

Figure 11:

Time Series of Relative Rates of Change of Percentage Contributions to Value Added (Ford)

In Figures 12 (a,b,c) and 13 (a,b,c) we present the value added "elasticities" of the components for General Motors and Ford respectively. The value added "elasticites" of dimensions give us the time series of the ratio of percentage change of each of the three components of value added over percentage change of value added.

We observe that for both General Motors and Ford the average value of the ratio of percentage increases (decreases) changes is around 70% for elasticities of payroll and benefits with respect to value added, (50%) for depreciation and (300%) for operating profits respectively.

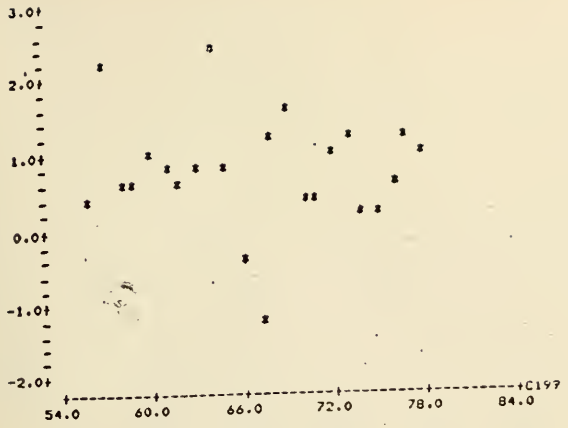


Figure 12(a):

Value Added "Elasticity" of Payroll and Benefits (GM)

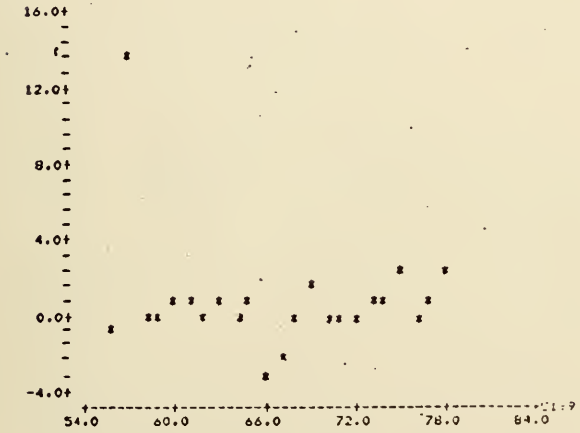


Figure 12(b):

Value Added "Elasticity" of Depreciation (GM)

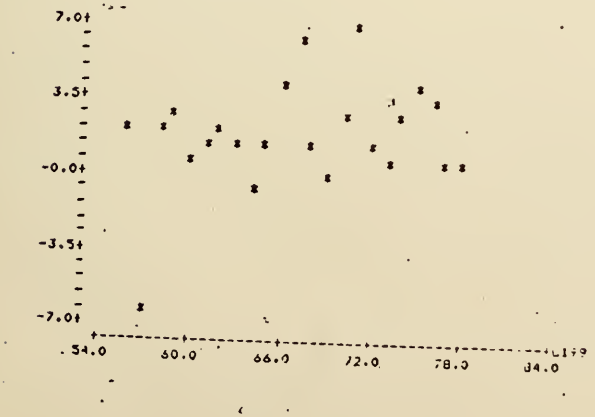


Figure 12(c):

Value Added "Elasticity" of Operating Profits (GM)

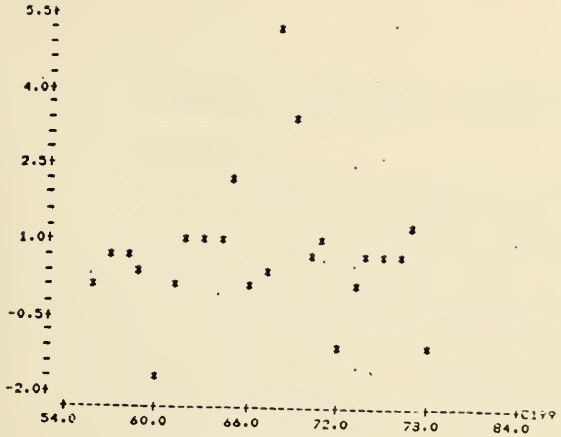


Figure 13(a):

Value Added "Elasticity" of Payroll and Benefits (Ford)

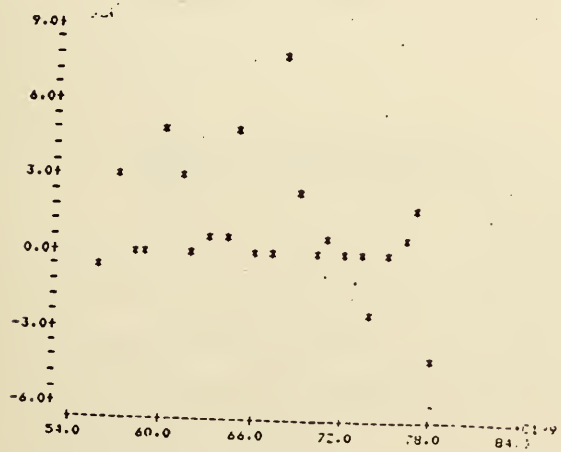


Figure 13(b):

Value Added "Elasticity" of Depreciation (Ford)

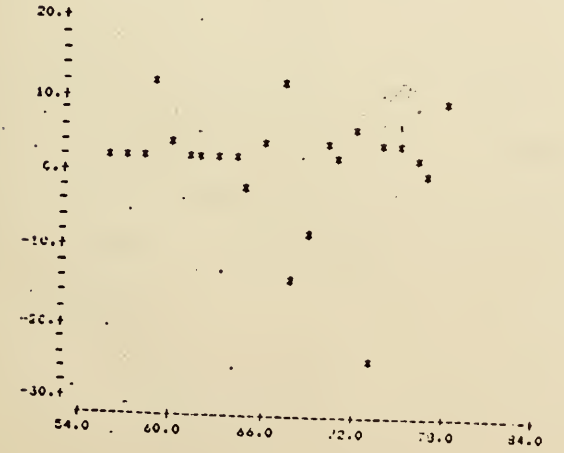


Figure 13(c):

Value Added "Elasticity" of Operating Profits (Ford)

IV. PRODUCTIVITY MEASUREMENT: COMPARISON WITH MANAGERIAL PERFORMANCE INDICATORS

Since productivity is one of the performance indicators of a firm, we are interested in finding out the relationship between productivity and various performance indicators used by management, such as return on sales, return on investment, etc. These relationships allow us to further explore the role of productivity in the operations of the firm. For the automobile industry, we are particularly interested in finding out the causal relationships among imported cars market share, productivity and profitability.

A. Managerial Performance Indicators

There are many criteria commonly used by management to evaluate the performance of a corporation, including return on sales, return on stockholders' equity, return on total assets, return on net property and equipment, and net income, where the term "return" is usually employed either as net income or as operating income (income before taxes, interest and extraordinary items).

Return on sales measures the overall profitability of a firm. A firm may increase its return on sales by reducing unit cost or by increasing prices. The reduction in unit costs reflects the improvement in production efficiency or reduction in value of materials purchased. The increase in prices, holding unit cost constant, reflects the market power of the firm. Therefore, return on sales represents mixed effects of efficiency and market power.

Return on assets (ROA), return on equity (ROE) and on net plant and equipment (ROP) are defined as returns divided by total assets, stockholders' equity, and net property & equipment respectively. ROA indicates how well the firm has utilized all its financial resources, without considering the relative magnitudes of these resources (long-term debt, stockholders' equity). ROA equals ROS divided by the asset turnover rate. Therefore, ROA reflects production efficiency, market power, and the efficiency in utilizing total assets to generate sales.

ROE, obviously, is of interest to present and respective shareholders, and is also of concern to management, which is supposed to operate the business in the stockholder's best interest, because it indicates how well the firm has utilized the shareholder's equity. Return on property and equipment (ROP) is a measure of the efficiency with which fixed assets have been employed.

Each of these four financial ratios can have two possible measures for its numerator (net income and operating income). Thus, we have eight performance indicators, which together with two measures of net income (nominal dollars and constant dollars) will be compared with our productivity measure.

B. Time Series of Managerial Performance Indicators

The time series of these ten performance indicators for General Motors and Ford are shown in Figures 14(a-k), 15(a-k). We observe that net income to sales and operating income to sales have patterns similar to our productivity measure. Both ratios have declined smoothly since 1962 for GM and 1959 for FORD. The rest of the ratios either show a cyclical or an increasing pattern that can not provide us with early warning signal.

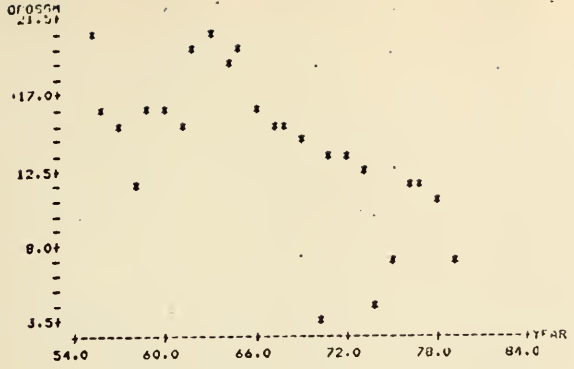


Figure 14(a):

Operating Return to Sales (GM)

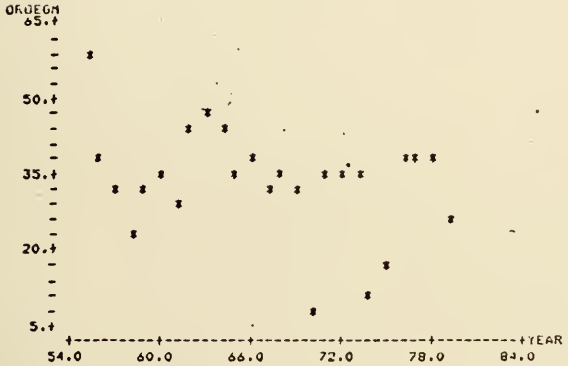


Figure 14(b):

Operating Return to Equity (GM)

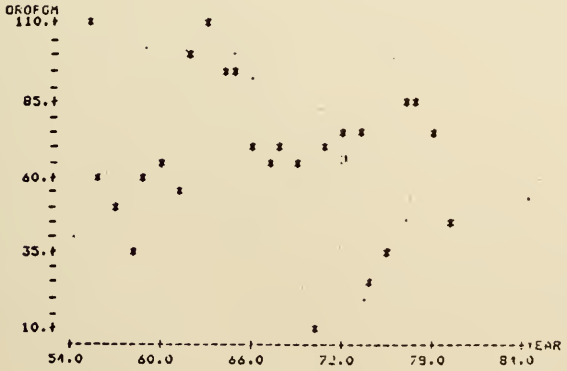


Figure 14(c):

Operating Return to Plant and Equipment (GM)

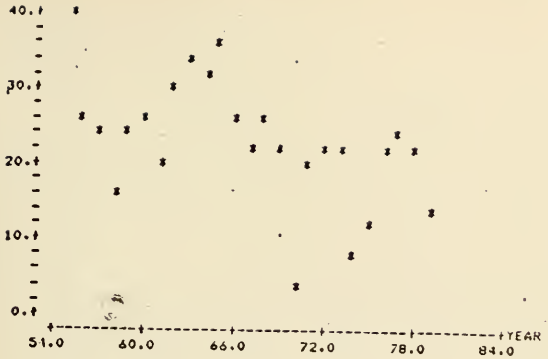


Figure 14(d):

Operating Return on Assets (GM)

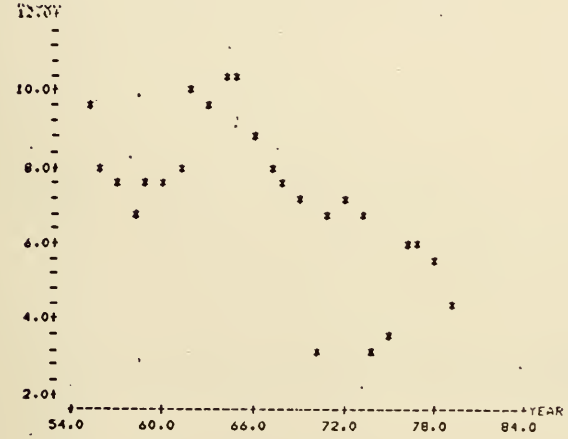


Figure 14(e):

Net Return on Sales (GM)

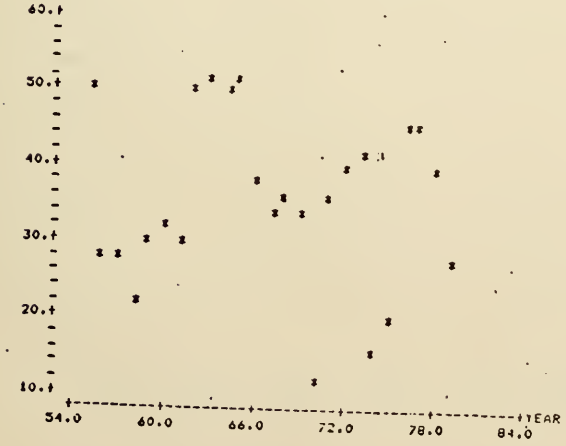


Figure 14(f):

Net Return on Plant and Equipment (GM)

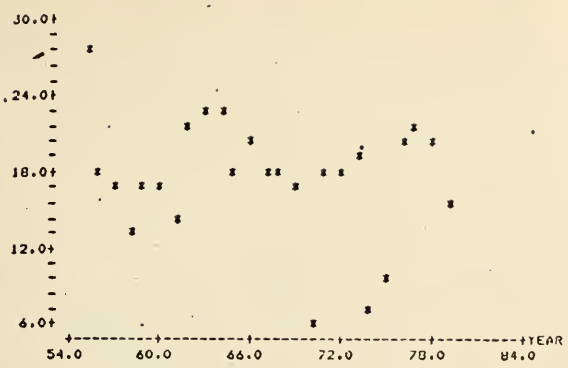


Figure 14(g):

Net Return on Equity (GM)

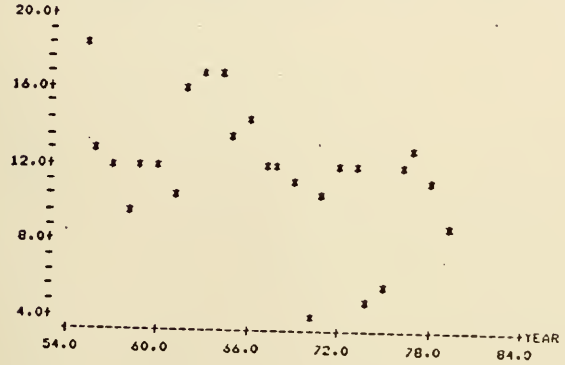


Figure 14(h):

Net Return on Assets (GM)

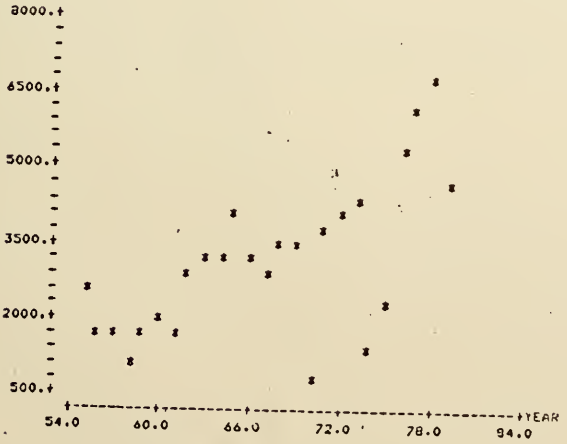


Figure 14(i):

Operating Income (GM)

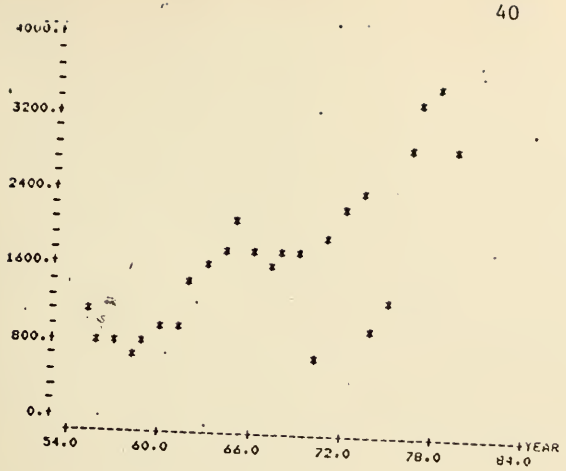


Figure 14(j):

Net Income (GM)

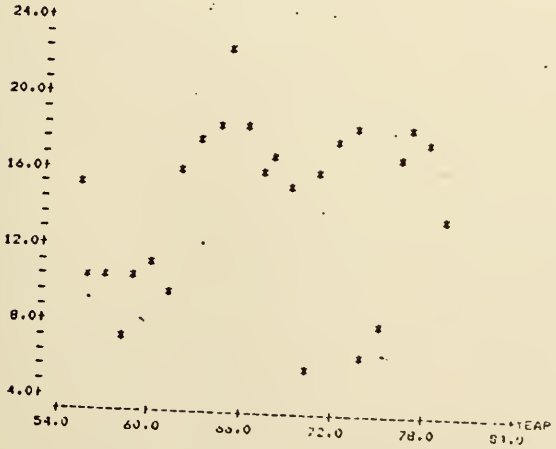


Figure 14(k):

Net Income in Constant Dollars (GM)

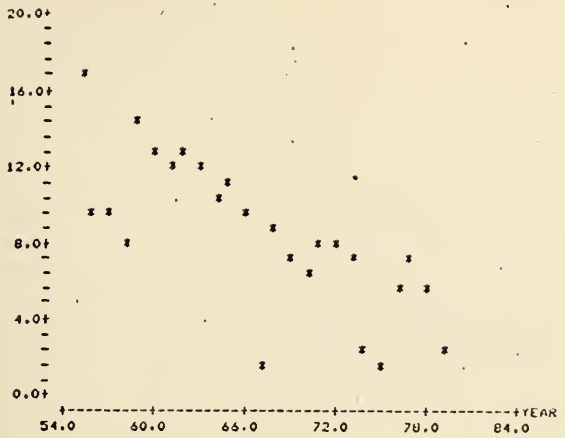


Figure 15(a):

Operating Return to Sales (Ford)

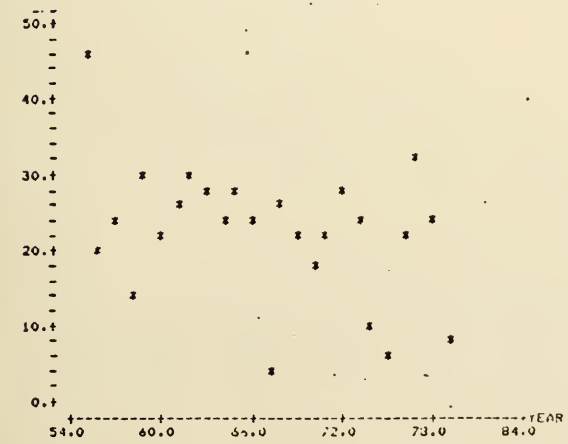


Figure 15(b):

Operating Return to Equity (Ford)

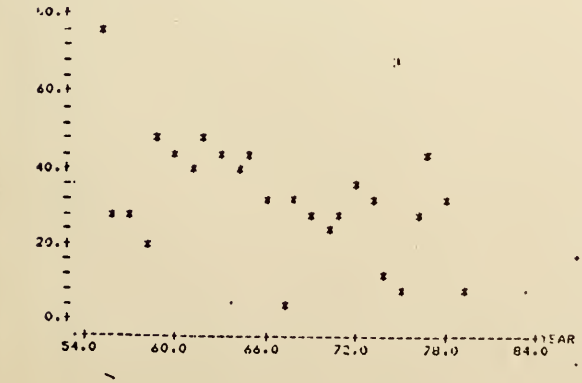


Figure 15(c):

Operating Return to Plant and Equipment (Ford)

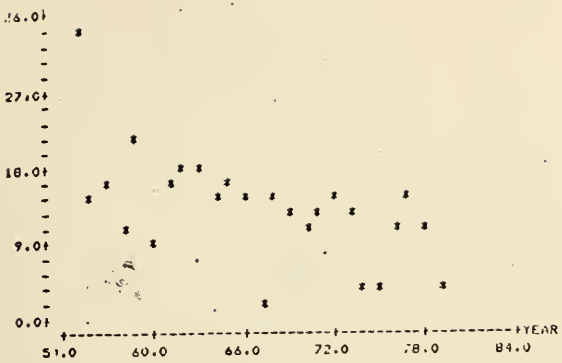


Figure 15(d):

Operating Return on Assets (Ford)

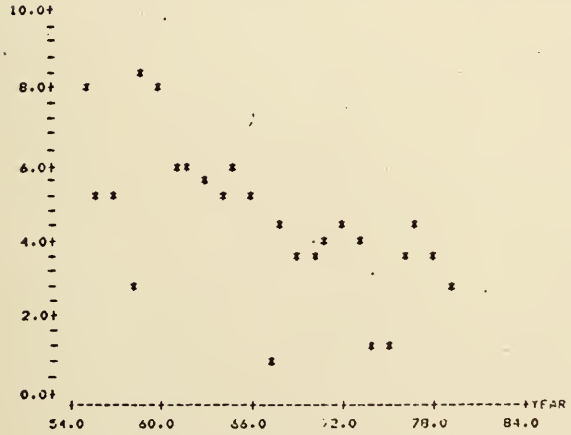


Figure 15(e):

Net Return on Sales (Ford)

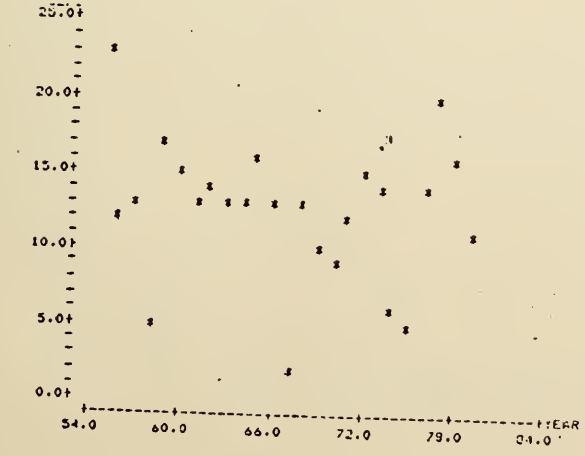


Figure 15(f):

Net Return on Plant and Equipment (Ford)

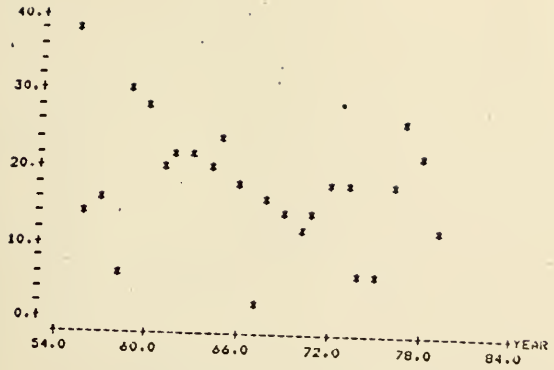


Figure 15(g):

Net Return on Equity (Ford)

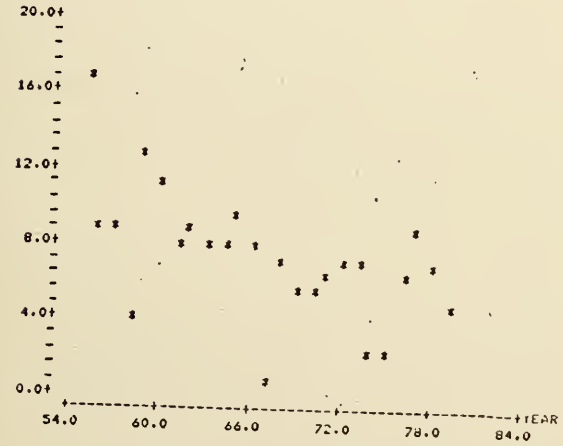


Figure 15(h):

Net Return on Assets (Ford)

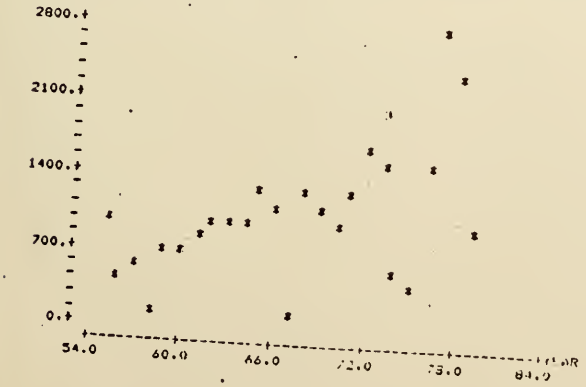


Figure 15(i):

Operating Income (Ford)

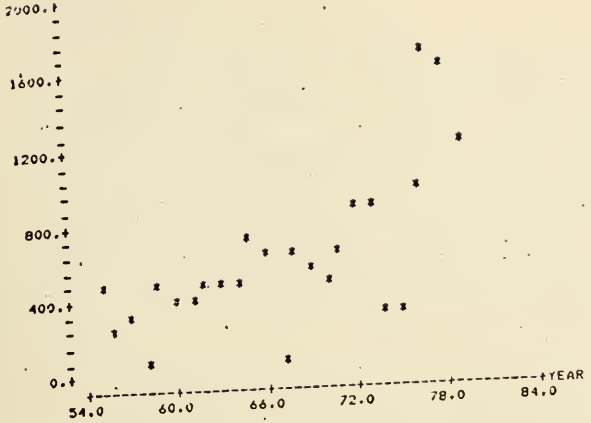


Figure 15(j):

Net Income (Ford)

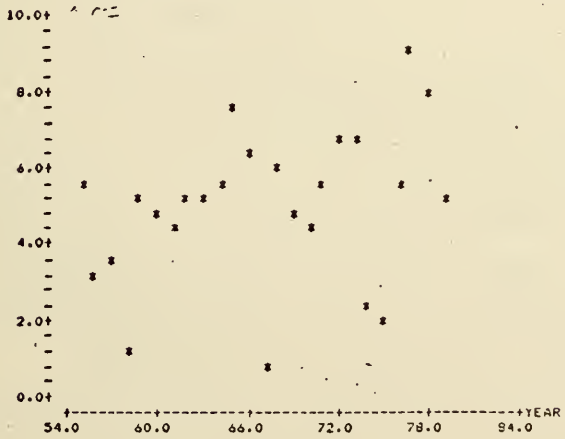


Figure 15(k):

Net Income in Constant Dollars (Ford)

The correlation coefficients of our productivity measure with the managerial performance indicators are shown in Figure 16(a,b) for GM and Ford. Value added per dollar of salaries and benefits is highly correlated with operating income to sales (OROS) and net income to sales (ROS) for both companies; the correlation coefficients are 0.938, 0.977 for GM, 0.868, 0.807 for FORD. Therefore, productivity may explain most of the variance of ROS and OROS.

The time series and correlation coefficients indicate that operating income to sales and net income to sales may be used as a surrogate measure of productivity, and hence provide managers with a quick diagnosis of the condition of their firms.

Two arguments complement our findings. First, the book value of property, assets, and stockholders' equity are the accumulation of past investments which are in nominal dollars of the respective years. Thus, the book value of these items is not homogeneous longitudinally. Sales and return figures are in current year dollars. Hence, in terms of homogeneity, only OROS and ROS are consistent with our productivity measure.

Second, net income is affected by "financial operations" such as the debt-equity ratio, extraordinary items and tax rates have nothing to do with the production efficiency of a firm. Operating income is an item without this deficiency and thus is theoretically superior to net income in measuring efficiency. Combining the above two arguments, we find that theoretically and empirically, operating income to sales describes best the performance of the firm among various performance indicators.

Since value added over payroll is highly correlated to OROS, we attempt in the following to test the relationships among three variables affecting performance: operating income to sales, productivity, and imported cars

	VA/PAYG	ROAGM	ROEGM	ROSGM	ROPGM	OROAGM	OROEGM	OROSGM	OROPGM
ROAGM	0.691								
ROEGM	0.733	0.951							
ROSGM	0.977	0.910	0.770						
ROPGM	0.671	0.866	0.910	0.748					
OROAGM	0.923	0.962	0.829	0.922	0.860				
OROEGM	0.781	0.953	0.992	0.782	0.877	0.929			
OROSGM	0.988	0.924	0.775	0.982	0.751	0.954	0.837		
OROPGM	0.737	0.899	0.937	0.750	0.905	0.910	0.924	0.811	
NIGM	-0.204	0.160	0.401	-0.076	0.514	0.119	0.296	-0.086	0.423
OIGM	-0.102	0.251	0.486	0.014	0.592	0.222	0.398	0.020	0.518

ROAGM = Return on Assets (GM)
ROEGM = Return on Equity (GM)
ROSGM = Return on Sales (GM)
ROPGM = Return on Plant (GM)
NIGM = Net Income (GM)

OROAGM = Operating Return on Assets (GM)
OROEGM = Operating Return on Equity (GM)
OROSGM = Operating Return on Sales (GM)
OROPGM = Operating Return on Plant (GM)
OIGM = Operating Income (GM)

VA/PAY = Value Added over Payroll and Benefits

Figure 16(a) (GM)

	VA/PAYF	ROAFD	ROEFD	ROSFD	ROPFD	OROAFD	OROEFD	OROSFD	OROPFD
ROAFD	0.737								
ROEFD	0.558	0.806							
ROSFD	0.807	0.943	0.773						
ROPFD	0.674	0.953	0.949	0.889					
OROAFD	0.780	0.896	0.769	0.896	0.810				
OROEFD	0.711	0.887	0.912	0.799	0.903	0.921			
OROSFD	0.858	0.896	0.693	0.945	0.810	0.899	0.837		
OROPFD	0.774	0.935	0.875	0.861	0.949	0.974	0.962	0.906	
NIFD	-0.195	0.103	0.531	-0.037	0.428	-0.033	0.268	-0.185	0.135
OIFD	-0.023	0.202	0.618	0.075	0.491	0.148	0.367	-0.005	0.310

ROAFD = Return on Assets (Ford)
ROEFD = Return on Equity (Ford)
ROSFD = Return on Sales (Ford)
ROPFD = Return on Plant (Ford)
NIFD = Net Income (Ford)

OROAFD = Operating Return on Assets (Ford)
OROEFD = Operating Return on Equity (Ford)
OROSFD = Operating Return on Sales (Ford)
OROPFD = Operating Return on Plant (Ford)
OIFD = Operating Income

VA/PAY = Value Added over Payroll and Benefits

Figure 16(b) (Ford)

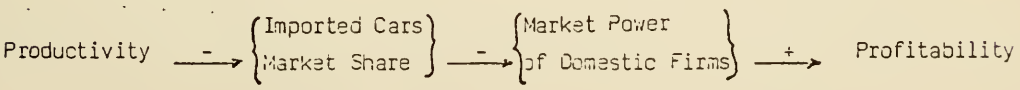
market share. We believe that these three variables can elucidate the problems of the U.S. Automobile industry.

C. Model Testing

In this section, we will test two models. The first model is symptomatic assuming that imported cars market share is an intervening variable between profitability and productivity. The second model assumes that productivity is the underlying cause of both imports market share and profitability.

1. Model 1

Market share of imported cars has increased since 1963 as shown in Figure 17. One plausible explanation is that the decline of the U.S. productivity allowed imports to penetrate the U.S. market. As a result the market shares of existing firms as well as their market power in raising prices declined, and thus their profitability fell. Thus, the first model is one where productivity affects imported cars market share which in turn, affects profitability. Model 1 is shown as follows:



Model 1

The arrows indicate the causal relationships and the signs indicate the positive or negative effect of the causal relations.

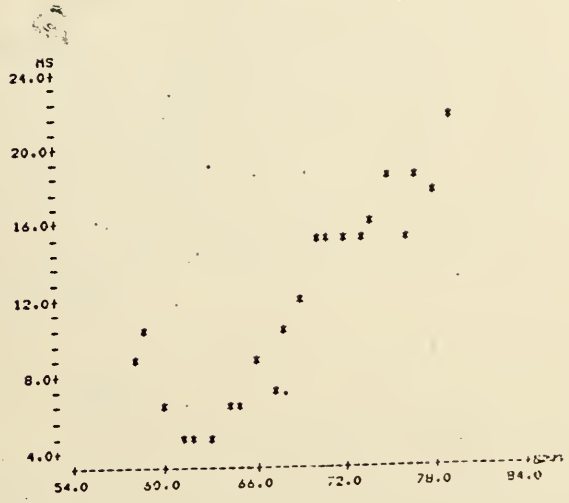


Figure 17:

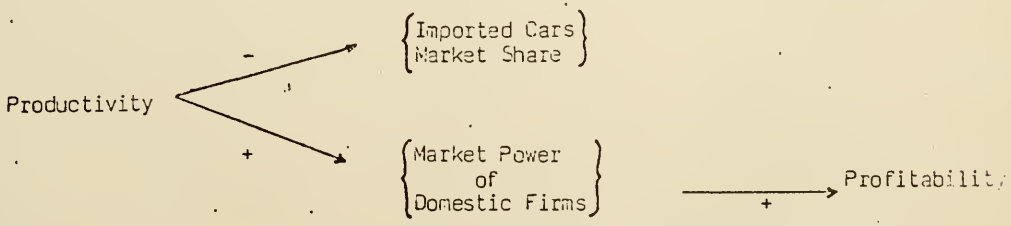
Imported Cars Market Share

It should be noted that Model 1 assumes that productivity will affect profitability through market share which permits the firm to raise its price above its average cost.

A piece of evidence supporting Model 1 is that the ratio of new car price index to auto producer price index shown in Figure 18 has declined since 1963, which is highly negatively related to the imported cars market share. The correlation coefficient is -0.913. A plausible hypothesis is therefore that U.S. automobile manufacturers had market power to by-pass their cost increase to consumers before the penetration of foreign cars, but not afterwards.

2. Model 2

A very strong assumption in Model 1 is that productivity affects profitability through market share increase or decrease. However, one may argue that in a market without collusion, the efficient firm will have lower average cost and is therefore able to act as a price leader who has market power to raise or lower prices. Therefore, market share does not affect profitability and the high negative correlation between imports market share and domestic firms' profitability is spurious. Therefore, the model becomes:



Model 1

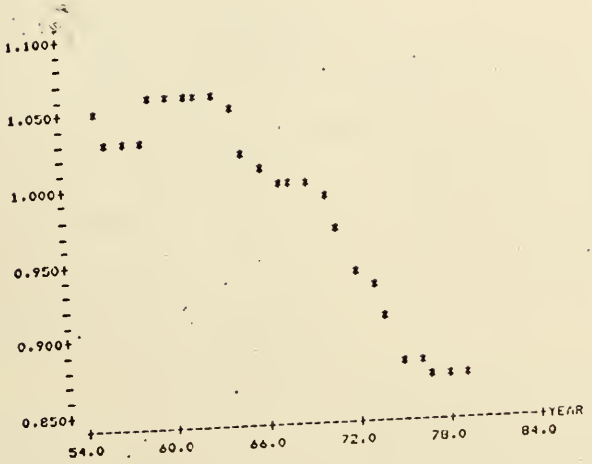


Figure 18:

New Car Price Index over Producer Price Index (Automobile Industry)

The difference between Model 1 and Model 2 is that Model 1 attributes the profitability to the "price effect", while Model II atrributes its "cost effect".

3. Statistical Results

If the relationships of Model 1 hold, the partial correlation coefficient between profitability and productivity should drop substantially after we controlled for market share of imported cars. However, if the relationships of Model 2 hold, then the partial correlation coefficient between imported cars market share and profitability should drop, after controlling for productivity.

In the present study, we use operating income to sales (OROS) as the measure of profitability. Let p_{ab} be the zero-order correlation coefficient between variables a and b, and $p_{ab.c}$ be the partial correlation coefficient between a and b, after controlling for c. The zero-order correlation coefficients and partial correlation coefficients between the three performance variables are shown in Figure 19.

We have four samples: GM, FORD, pooling data of GM and FORD, and SIC code 371 industry (Motor Vehicle and Equipment from IRS Reports). We have pointed out that if model 1 is correct then $p_{13.2}$ should rop to zero, and if model 2 is correct then $p_{23.1}$ will drop to zero.

We observe that the conditional correlation ($p_{13.2}$) between productivity and profitability does not change very much from their zero-order correlation coefficient (p_{13}). This result indicates that productivity directly affects profitability, and thus imports market share is not an intervening variable. Hence, Model 1 is rejected.

For model 2, the results from FORD and pooling data generally confirm the model. For pooling data, the correlation coefficient between

	GM	FORD	POOLING	INDUSTRY
ρ_{12}	-0.861	-0.652	-0.683	-0.402
ρ_{23}	-0.834	-0.630	-0.629	-0.895
ρ_{13}	-0.938	0.852	0.940	0.693
$\rho_{13.2}$	0.979	0.732	+0.898	0.819
$\rho_{23.1}$	0.612	-0.348	0.030	-0.936

Variable 1: $\frac{\text{Value added}}{\text{Payroll}}$

Variable 2: Market share imports

Variable 3: $\frac{\text{Operating income}}{\text{Sales}}$

Figure 19

profitability and imports market share was -0.629 originally. After taking away the effect of productivity, the conditional correlation coefficient drops to 0.03. This result indicates that imported cars market share is no longer related to profitability if productivity does not change. A similar result is found for FORD, in that correlation is weakened after controlling for productivity, (from -0.690 to 0.348). However, $p_{23.1}$ for GM and the industry 371 are very strange. We observe that $p_{23.1}$ for GM is "positive" which means that imports market share is positively related to GM's profitability if GM's productivity does not change. This result may be tentatively explained by accepting the hypothesis that imported cars eroded the market position of GM's domestic competitors which resulted in increased profitability for General Motors and foreign cars at the expense of Ford.

We tend to accept the result of pooling data because GM and FORD are different in productivity and thus neither of them represents the universe. However, by pooling them together, the sample may represent the universe very well. For example, suppose the distributions of two samples are shown in Figure 20(a) after pooling the data, the distribution would be a normal distribution as shown in Figure 20(b) which represents the true distribution of the population.

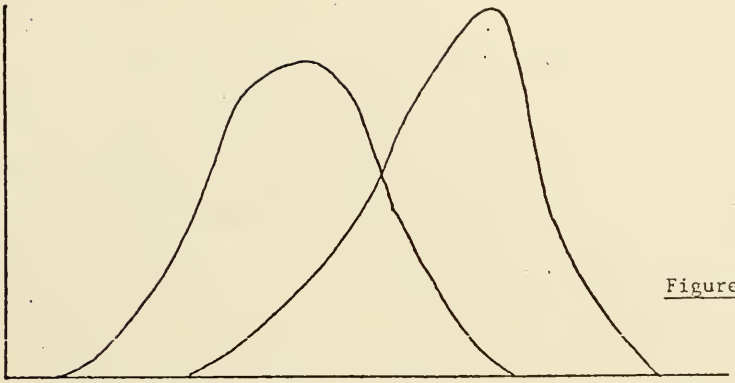


Figure 20(a)

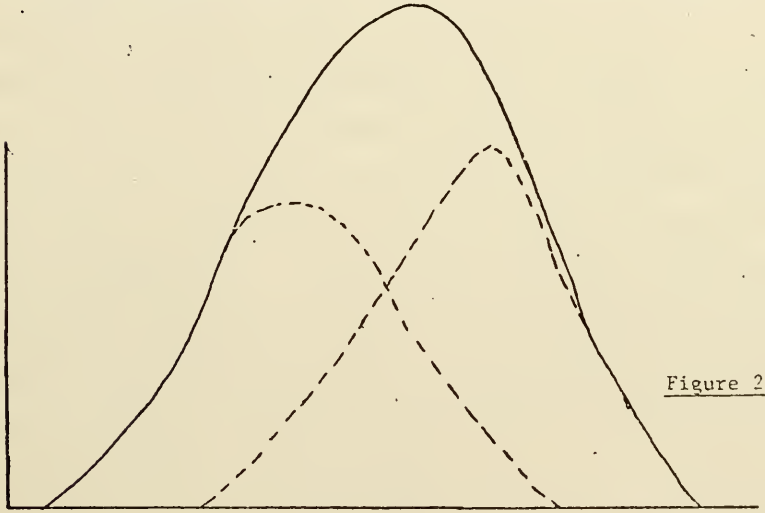


Figure 20(b)

V. CONCLUSIONS

We have observed that our productivity measure for both GM and FORD has declined. However, we should stress again that, although our productivity measure correlates well with managerial performance indicators it is a single factor productivity measure. For instance, if labor replaces capital, the decline of labor productivity may increase capital productivity which may offset the decline of labor productivity.

Ideally, only total factor productivity shows the overall efficiency of the conversion of input to output. Some researchers (Jorgenson, Friendenlander) have used the production function approach to calculate total factor productivity growth. However, these studies are not free of inpurities in calculating capital input and total output; they also assume competitive factor markets. These conditions make the calculation of total factor productivity impractical. Although we have also used an impure measure of capital input, as an alternative approach we have analyzed the change of the components of value added to identify various hypotheses concerning the overall efficiency of the U.S. Automobile industry as reflected in the performance of General Motors and Ford.

Two hypotheses may explain the growth of the share of payroll and benefits (labor input) in the value added. The first hypothesis assumes a competitive about market and the growth of payroll and benefits percentage reflects the efficiency of resource ultilization. The second story assumes a non-competitive labor market and the growth of payroll and benefits percentage would not imply improvement in efficiency.

A. Competitive Labor Market

In a competitive factor market, the only reason explaining why labor input increases faster than capital input is that the marginal product value per dollar of payroll and benefits is greater than marginal product value per dollar of capital. Under these circumstances, the firm prefers to use labor to substitute for capital and the share of payroll and benefits increases.

As labor substitutes capital, capital input decreases and thus the percentage contribution of depreciation in value added decreases. However, we do not know whether the percentage contribution of profits to value added would increase or decrease. This depends on whether the decrease in the share of depreciation can offset the increase in the share of payroll and benefits. If this is the case, the firm is moving toward cost minimization by rational input factor substition and is improving its efficiency.

The real wage rate (wage rate adjusted by the consumer price index) has grown 2.64% per year for GM and 3.34% for Ford. If the marginal product value of capital increases, due to process innovations or low capital cost, the physical labor productivity should grow even faster. One may argue that if the workers in both firms were so productive, the industry would not be in today's difficulties. However, there is always the possibility that labor has been very productive while at the same time the industry is in trouble. That is because the firm made wrong strategic decisions (e.g. low new investment rate for the production of small cars), which resulted in the decline of profits due to foreign competition. In this case, the problem is industry effectiveness not efficiency.

B. Non-Competitive Labor Market

The second explanation of the phenomena observed is that the labor market is not competitive. The labor union (UAW) had monopoly power over the firms and was able to increase wages faster than the growth of physical productivity.

In a non-competitive product market, the firm can pass on labor cost increases to consumers. However, in a competitive product market, the firm cannot increase prices accordingly and the increase in labor cost reduces profits. Therefore, under such circumstances, we would observe that the percentage contribution of payroll and benefits to value added increases and that of profits decreases.

The question, why the percentage contribution of payroll and benefits had not increased before 1963, may be satisfactorily answered. The product market was not competitive before 1963 and firms were able to pass on their cost increases to consumers. One piece of evidence supporting the competitiveness of the market is the market share of imports, which has consistently increased since 1963, as shown in Figure 17. Due to competition, the ratio of new car price index to producer price index was greater than one before 1963, but not after 1963 as shown in Figure 18.

If this were the case, then, the management had several alternatives in coping with this problem. First, firms might increase their purchases of materials and services, because it was cheaper to buy from an outside competitive market than to produce themselves. Second, firms might increase their foreign operations and then import cars from their foreign subsidiaries. Third, firms might reduce labor input and increase capital input, if they are subsitutable.

Our data confirm that both GM and Ford have gradually reduced their degree of vertical integation, as shown in Figure 1(a,b,c,d). We observe that value added over sales has declined since 1963 for GM and 1960 for Ford. The percentage of foreign operations in total sales for both companies are shown in Figure 21 for Ford; we have not found similar information of GM. We observe that the share of foreign operations increases. This phenomenon can be attributed to importing assembled automobiles, outsourcing of parts and also to increasing demand in foreign countries. We have no data on parts imported by GM and Ford, but we will obtain such data in our further field research.

The time series of gross plant and equipment per employee shown in Figures 22(a) and 23(a) for General Motors and Ford respectively show an increasing pattern. This means that management attempted over time to substitute capital for labor, as economic theory would predict. However, the rate of increase of payroll and benefits was so high that the time series of gross plant and equipment per dollar of payroll and benefits shown in Figures 22(b) and 23(b) have been decreasing since the mid-sixties for both firms.

Hence, not only the market became more competitive in the mid-sixties, but also management did not use capital to substitute for labor fast enough. There are several reasons for that: (i) labor and capital were not substitutable at a faster rate; (ii) high cost fixities prohibited the management from investing in new equipment; (iii) the management had a short term predisposition and (iv) management expected that the union would ask for a higher share in value added were the firm to show more profits.

	Imports of Ford as a Percentage of Ford's Domestic Production	Sales of Foreign Operations as a Percentage of Total Sales
71	2.67%	30%
72	5.08%	31%
73	6.56%	31%
74	5.18%	35%
75	6.11%	40%
76	3.98%	37%
77	5.65%	34%
78	6.08%	35%
79	6.43%	44%
80	10.65%	50%

Figure 21:

Foreign Operations of Ford

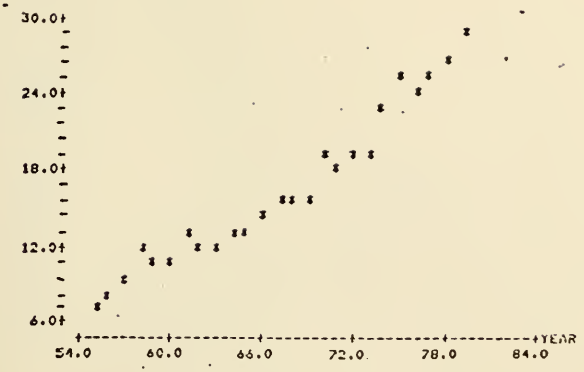


Figure 22(a):

Plant and Equipment per Employee (GM)

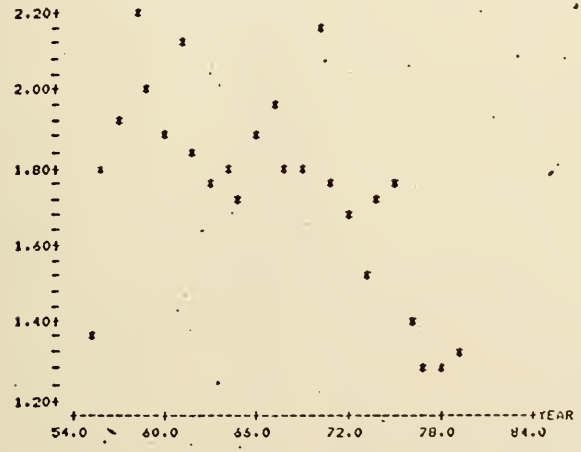


Figure 22(b):

Plant and Equipment over Payroll and Benefits (GM)

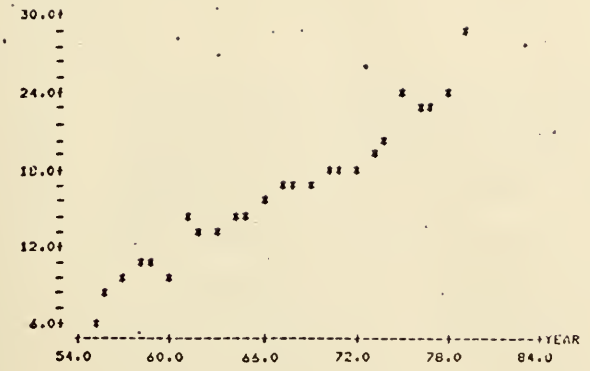


Figure 23(a):

Plant and Equipment per Employee (Ford)

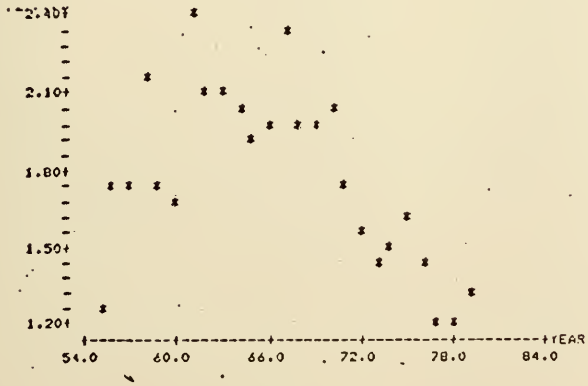


Figure 23(b):

Plant and Equipment over Payroll and Benefits (Ford)

High labor fixities, uncertainty and excessive union power seem to be the reasons explaining the decline of productivity and the increase (decrease) of payroll and benefits (profits) in the value added of the U.S. Automobile Industry in the past 25 years.

Although our second hypothesis enjoys stronger data support than our first hypothesis, further research in the causes of productivity change the impact of fixities on innovation will shed more light into this puzzle.

APPENDIX FOR PLOTS

Figure 1(a):

Value Added over Sales (GM)

55 0.501228
56 0.489043
57 0.490494
58 0.492306
59 0.492513
60 0.500729
61 0.509980
62 0.516326
63 0.520340
64 0.510266
65 0.511894
66 0.504528
67 0.503784
68 0.504561
69 0.488342
70 0.441058
71 0.481154
72 0.475346
73 0.455450
74 0.398452
75 0.412844
76 0.430770
77 0.427867
78 0.422970
79 0.402169

Figure 1(b):

Value Added over Sales (Ford)

55 0.450900
0.442187
0.415179
0.439359
0.483854
0.483180
0.409002
0.409790
0.380442
0.389671
0.397741
0.386840
0.347503
0.395500
0.377422
0.376703
0.415021
0.405780
0.285920
0.339201
0.323544
0.350005
0.351492
0.343873
79 0.325546

Figure 1(c):

Value Added of Cost of Goods Sold over Cost of Goods Sold (GM)

55 0.301374
0.321366
0.331736
0.369352
0.307273
0.341421
0.350906
0.323153
0.325105
0.309445
0.324147
0.345454
0.350633
0.348258
0.302157
0.314089
0.325213
0.310256
0.284687
0.266267
0.314436
0.278204
0.279680
0.283540
79 0.284277

Figure 1(d):

Value Added of Cost of Goods Sold over Cost of Goods Sold (Ford)

55 0.249551
0.302947
0.263385
0.364646
0.301623
0.321133
0.215628
0.219752
0.192274
0.207902
0.221324
0.218547
0.245431
0.252191
0.231755
0.238770
0.267898
0.252798
0.103177
0.222128
0.215717
0.218694
0.218472
0.219162
79 0.232055

Figure 2(a):

Value Added over Payroll and Benefits (GM)

55 2.02033
1.82269
1.80484
1.68685
1.82446
1.80945
1.77252
1.95062
1.99817
1.92859
1.96235
1.82960
1.78667
1.76135
1.72817
1.34846
1.67843
1.67290
1.62301
1.34057
1.43599
1.59039
1.55906
1.55845
79 1.42148

Figure 2(b):

Depreciation over Payroll and Benefits (GM)

55 0.222324
0.256295
0.281644
0.318796
0.268634
0.268125
0.267328
0.246380
0.247549
0.233741
0.236262
0.269959
0.273135
0.240029
0.237536
0.239433
0.222146
0.204942
0.191424
0.174414
0.207702
0.172307
0.155067
0.175720
79 0.168490

Figure 2(c):

Depreciation over Payroll and Benefits in Constant Dollars (GM)

55 17.8304
20.8624
23.7426
27.6077
23.4518
23.7827
23.9526
22.3220
22.7002
21.7145
22.3267
26.2400
27.3135
25.0110
26.0815
27.8460
26.9464
25.6792
25.4785
25.7609
33.4816
29.3783
28.1446
34.3357
79 36.6279

Figure 2(d):

Capital Expenditures (Current Year) over Pay and Benefits (GM)

55 0.191685
0.303418
0.158479
0.099402
0.102544
0.149085
0.153649
0.163602
0.148264
0.200060
0.240147
0.211704
0.160587
0.130497
0.149578
0.181188
0.125544
0.107828
0.112260
0.149188
0.119562
0.076969
0.121876
0.159415
79 0.178244

Figure 2(e):

Capital Expenditures (One Year Lag) over Payroll and Benefits (GM)

56 0.280702
0.161471
0.090091
0.118072
0.168557
0.142622
0.196977
0.164135
0.212957
0.284681
0.215675
0.162627
0.151366
0.158351
0.162532
0.161666
0.116612
0.133454
0.140726
0.122847
0.099450
0.144159
0.178349
79 0.195136

Figure 2(f):

Capital Expenditures (One Year Lead) over Payroll and Benefits (GM)

56 0.207196
0.297796
0.174858
0.086330
0.090698
0.160611
0.127615
0.147782
0.139285
0.168764
0.235726
0.209048
0.138447
0.123268
0.166746
0.140704
0.116087
0.090704
0.119011
0.145198
0.092534
0.065072
0.108275
79 0.144729

Figure 2(g):

Operating Profits over Payroll and Benefits (GM)

55 0.798008
0.566391
0.523192
0.368054
0.555822
0.541324
0.505191
0.704243
0.750618
0.694852
0.726086
0.559644
0.513530
0.521322
0.490635
0.109029
0.456284
0.467961
0.431587
0.166159
0.228291
0.418084
0.403992
0.382726
79 0.252987

Figure 3(a):

Value Added over Payroll and Benefits (Ford)

55 1.83351
1.52170
1.62134
1.42015
1.76223
1.61266
1.75376
1.77444
1.63696
1.66167
1.69460
1.63037
1.29957
1.58132
1.52329
1.48302
1.57374
1.57281
1.11061
1.31498
1.30638
1.42947
1.48569
1.42930
79 1.29522

Figure 3(b):

Depreciation over Payroll and Benefits (Ford)

56 0.168038
0.192158
0.258129
0.331579
0.242952
0.195674
0.250111
0.210160
0.204638
0.204142
0.196318
0.211466
0.239827
0.210862
0.216141
0.213165
0.189342
0.172921
0.153789
0.147103
0.168282
0.141567
0.122661
0.125237
79 0.145811

Figure 3(c):

Depreciation over Payroll and Benefits in Constant Dollars (Ford)

56 13.4767
15.6417
21.7603
28.7147
21.2097
17.3563
22.4099
19.0405
18.7653
18.9648
19.5521
20.5545
23.9827
21.9718
23.7323
24.7911
22.9672
21.6670
20.4693
21.7272
27.1271
24.1372
22.2630
24.4713
79 31.6993

Figure 3(d):

Capital Expenditures (Current Year) over Payroll and Benefits (Ford)

56 0.180981
0.409208
0.277332
0.139309
0.096414
0.146120
0.169234
0.147597
0.170823
0.198152
0.227071
0.232297
0.234541
0.130316
0.143476
0.145889
0.139960
0.140488
0.144625
0.132608
0.101422
0.076422
0.119420
0.149814
79 0.195605

Figure 3(e):

Capital Expenditures (One Year Lag) over Payroll and Benefits (Ford)

55 0.391995
0.304354
0.113341
0.117845
0.154545
0.169847
0.177347
0.185736
0.224675
0.269180
0.249955
0.221764
0.164047
0.150354
0.151571
0.157590
0.170583
0.168831
0.135023
0.097835
0.090986
0.150749
0.172664
79 0.205182

Figure 3(f):

Capital Expenditures (One Year Lead) over Payroll and Benefits (Ford)

56
0.188927
0.372876
0.340872
0.113974
0.091158
0.145592
0.140845
0.135746
0.150657
0.167154
0.211029
0.245681
0.186315
0.124355
0.130090
0.129569
0.115260
0.120345
0.142030
0.137469
0.085187
0.060539
0.103616
0.142821

Figure 3(g):

Operating Profits over Payroll and Benefits (Ford)

55
0.665471
0.329540
0.363214
0.088569
0.519276
0.416984
0.503644
0.564277
0.432321
0.457533
0.498286
0.418905
0.059744
0.370459
0.307148
0.269054
0.304395
0.379896
-0.043175
0.167874
0.138097
0.287905
0.363028
0.304060
79 0.149410

Figure 6(a):

Payroll and Benefits over Value Added (GM)

55
0.494968
0.548641
0.554067
0.592821
0.548108
0.552654
0.564169
0.512657
0.500459
0.518513
0.509594
0.546567
0.559702
0.567746
0.578646
0.741586
0.595795
0.597763
0.616139
0.745950
0.696382
0.628776
0.641413
0.641665
79 0.703493

Figure 6(b):

Depreciation over Valu Added (GM)

55
0.110043
0.140614
0.156050
0.188989
0.147241
0.148181
0.150818
0.126308
0.123888
0.121198
0.120397
0.147550
0.152874
0.136276
0.137450
0.177560
0.132354
0.122507
0.117944
0.130104
0.144640
0.108343
0.099462
0.112753
79 0.118532

Figure 6(c):

Depreciation over Value Added in Constant Dollars (GM)

55
0.394988
0.310745
0.289883
0.218190
0.304651
0.299165
0.285013
0.361035
0.375653
0.360290
0.370009
0.305883
0.287424
0.295979
0.283904
0.080854
0.271851
0.279730
0.265917
0.123946
0.158978
0.262881
0.259125
0.245582
79 0.177975

Figure 7(a):

Payroll and Benefits over Value Added (Ford)

55
0.545402
0.657161
0.616772
0.704152
0.567463
0.620094
0.570205
0.563559
0.610889
0.601802
0.590108
0.613357
0.769485
0.632303
0.656474
0.674300
0.635430
0.635806
0.900403
0.760469
0.765475
0.699558
0.673088
0.699644
79 0.772069

Figure 7(b):

Depreciation over Value Added (Ford)

55
0.091648
0.126279
0.159207
0.233482
0.137867
0.121336
0.142614
0.118437
0.125011
0.122853
0.115849
0.129704
0.184543
0.133345
0.141891
0.143737
0.120314
0.109944
0.138472
0.111868
0.128816
0.099035
0.082562
0.087621
79 0.112574

Figure 7(c):

Depreciation over Value Added in Constant Dollars (Ford)

55
0.362949
0.216560
0.224020
0.062366
0.294670
0.258569
0.287180
0.318003
0.264100
0.275344
0.294042
0.256939
0.045972
0.234272
0.201635
0.181962
0.244256
0.254250
-0.038875
0.127663
0.105710
0.201407
0.244350
0.212734
79 0.115355

Figure 6(d): Capital Expenditures (Current Year) over Value Added (GM)

55
0.094878
0.166467
0.087808
0.058928
0.056205
0.082392
0.086684
0.083872
0.074200
0.103734
0.122377
0.115711
0.089881
0.074089
0.086553
0.134366
0.074799
0.064456
0.069168
0.111287
0.083261
0.048396
0.078173
0.101668
79
0.125393

Figure 6(e): Capital Expenditures (One Year Lag) over Value Added (GM)

56
0.138939
0.088589
0.049917
0.069996
0.092388
0.078821
0.111128
0.084145
0.106576
0.147611
0.109906
0.088987
0.084720
0.089903
0.094049
0.119890
0.069477
0.079774
0.086707
0.091637
0.069256
0.090644
0.114395
79
0.125212

Figure 6(f): Capital Expenditures (One Year Lead) over Value Added (GM)

56
0.113676
0.164999
0.103659
0.047319
0.050125
0.090612
0.065423
0.073959
0.072221
0.086001
0.128040
0.117005
0.078603
0.071328
0.123657
0.093831
0.069393
0.055886
0.088776
0.101113
0.058183
0.041738
0.069476
79
0.101816

Figure 6(g): Operating Profits over Value Added (GM)

55
0.394988
0.310745
0.289083
0.218190
0.304651
0.299165
0.285013
0.361035
0.375653
0.360290
0.370009
0.305883
0.287424
0.295979
0.283904
0.080854
0.271851
0.278730
0.265917
0.123946
0.158978
0.262881
0.259125
0.245582
79
0.177975

Figure 7(d): Capital Expenditures (Current Year) over Value Added (Ford)

55
0.098707
0.268915
0.171051
0.098095
0.054711
0.090608
0.096498
0.083180
0.104354
0.119248
0.133996
0.142481
0.180476
0.082410
0.094188
0.098373
0.088935
0.088323
0.130221
0.100844
0.077636
0.053461
0.080380
0.104816
79
0.151021

Figure 7(e): Capital Expenditures (One Year Lag) over Value Added (Ford)

56
0.213795
0.200010
0.069906
0.082981
0.087699
0.105321
0.101124
0.104673
0.137251
0.161993
0.147500
0.136020
0.126232
0.095081
0.099502
0.106263
0.108393
0.107311
0.121575
0.074401
0.069647
0.105458
0.116218
79
0.143555

Figure 7(f): Capital Expenditures (One Year Lead) over Value Added (Ford)

56
0.124156
0.229979
0.240025
0.064676
0.056526
0.083017
0.079375
0.082926
0.090666
0.098639
0.129436
0.189048
0.117822
0.081636
0.093119
0.082332
0.073288
0.108359
0.108015
0.105229
0.059593
0.040748
0.072494
79
0.110268

Figure 7(g): Operating Profits over Value Added (Ford)

55
0.362949
0.216560
0.224020
0.062366
0.294670
0.258569
0.287180
0.318003
0.264100
0.275344
0.294042
0.256939
0.045972
0.234272
0.201635
0.181962
0.244256
0.254250
-0.038875
0.127663
0.105710
0.201407
0.244350
0.212731
79
0.115355

Figure 12(a):

Value Added "Elasticity" of Payroll and Benefits (GM)

0.4527
2.1214
0.6125
0.6172
1.0767
0.7911
0.6277
0.7987
2.3526
0.8994
-0.3739
-1.1487
1.1145
1.5152
0.3431
0.4773
1.0457
1.2312
0.2560
0.2731
0.6777
1.1461
1.0033
79 -65.6095

Figure 12(b):

Value Added "Elasticity" of Depreciation (GM)

56 -0.4021
13.4466
-0.1693
-0.1212
1.0590
0.8216
0.3374
0.8379
0.1858
0.9614
-3.2706
-2.2261
0.1347
1.2312
0.3193
0.3231
-0.0294
0.7198
0.6363
2.2222
0.1668
0.4042
2.2012
79 -34.4283

Figure 12(c):

Value Added "Elasticity" of Operating Profits (GM)

56 2.076
-6.612
2.370
3.011
0.834
1.474
2.087
1.343
-0.533
1.158
4.282
6.396
1.237
-0.095
2.668
7.281
1.401
0.629
2.883
4.092
3.170
0.896
0.530
79 191.306

Figure 13(a):

Value Added "Elasticity of Payroll and Benefits (Ford)

56 0.2052
0.5755
0.6487
0.4302
-1.7957
0.0397
0.9343
28.5108
0.8866
0.8876
2.1577
0.2212
0.4868
5.0561
3.3934
0.6465
1.0034
-0.9527
0.0886
0.8486
0.6295
0.8409
1.4022
79 -0.9904

Figure 13(b):

Value Added "Elasticity" of Depreciation (Ford)

56 -0.4656
2.8010
-0.1569
-0.2021
4.6142
3.0932
0.0446
19.1813
0.8684
0.6701
4.5143
-0.2937
0.2009
7.8236
2.1468
0.0006
0.5101
-0.2175
-0.1267
-2.4843
0.0052
0.3005
1.6247
79 -4.4761

Figure 13(c):

Value Added "Elasticity" of Operating Profits (Ford)

56 2.5644
1.2379
2.7895
11.9337
4.6930
2.3208
1.6048
-54.5255
1.3246
1.3929
-2.7080
3.5123
12.7986
-13.8329
-7.5994
3.0994
1.2326
6.4097
-24.1228
4.9549
4.8954
1.8966
-0.3189
79 9.8016

Figure 14(a):

Operating Return to Sales (GM)

55 20.5600
15.9700
14.7600
11.3800
15.6800
15.7200
15.2500
19.3400
20.2200
19.0400
19.5600
15.9900
15.0200
15.4100
14.0400
3.4700
13.2500
13.6300
12.2000
4.8200
6.6700
11.4400
11.2200
10.5200

Figure 14(b):

Operating Return to Equity (GM)

55 60.1100
37.6400
33.0600
21.6100
32.8100
34.4300
28.8600
42.6000
46.8300
42.5700
35.3200
37.0500
32.4600
35.9400
33.3600
6.6000
34.6400
35.5300
34.7400
12.1400
18.2000
37.6600
39.1300
37.9200

Figure 12(a):

Value Added "Elasticity" of Payroll and Benefits (GM)

56	0.4527
	2.1214
	0.6125
	0.6172
	1.0767
	0.7911
	0.6277
	0.7987
	2.3526
	0.8994
	-0.3739
	-1.1487
	1.1145
	1.5152
	0.3431
	0.4773
	1.0457
	1.2312
	0.2560
	0.2731
	0.6777
	1.1441
	1.0033
79	-65.6095

Figure 12(b):

Value Added "Elasticity" of Depreciation (GM)

56	-0.4021
	13.4466
	-0.1693
	-0.1212
	1.0590
	0.8216
	0.3374
	0.8379
	0.1858
	0.9614
	-3.2706
	-2.2261
	0.1347
	1.2312
	0.3193
	0.3231
	-0.0294
	0.7198
	0.6363
	2.2222
	0.1668
	0.4042
	2.2012
79	-34.4283

Figure 12(c):

Value Added "Elasticity" of Operating Profits (GM)

56	2.076
	-6.612
	2.370
	3.011
	0.934
	1.474
	2.087
	1.343
	-0.533
	1.158
	4.282
	6.396
	1.237
	-0.095
	2.668
	7.281
	1.401
	0.629
	2.883
	4.092
	3.170
	0.896
	0.530
79	191.306

Figure 13(a):

Value Added "Elasticity of Payroll and Benefits (Ford)

56	0.2052
	0.5755
	0.6487
	0.4302
	-1.7957
	0.0397
	0.9343
	28.5108
	0.8866
	0.8876
	2.1577
	0.2212
	0.4868
	5.0561
	3.3934
	0.6465
	1.0034
	-0.9527
	0.0886
	0.8486
	0.6295
	0.8409
	1.4022
79	-0.9904

Figure 13(b):

Value Added "Elasticity" of Depreciation (Ford)

56	-0.4656
	2.8010
	-0.1569
	-0.2021
	4.6142
	3.0932
	0.0446
	19.1813
	0.8684
	0.6701
	4.5143
	-0.2937
	0.2009
	7.8236
	2.1468
	0.0006
	0.5101
	-0.2175
	-0.1267
	-2.4843
	0.0052
	0.3005
	1.6247
79	-4.4761

Figure 13(c):

Value Added "Elasticity" of Operating Profits (Ford)

56	2.5644
	1.2379
	2.7895
	11.9337
	4.6930
	2.3208
	1.6048
	-54.5255
	1.3246
	1.3929
	-2.7080
	3.5123
	12.7986
	-13.8329
	-7.5994
	3.0994
	1.2326
	6.4097
	-24.1228
	4.9549
	4.8954
	1.8966
	-0.3189
79	9.8016

Figure 14(a):

Operating Return to Sales (GM)

55	20.5600
	15.9700
	14.7600
	11.3800
	15.6800
	15.7200
	15.2500
	19.3400
	20.2200
	19.0400
	19.5600
	15.9900
	15.0200
	15.4100
	14.0400
	3.4700
	13.2500
	13.6300
	12.2000
	4.8200
	6.6700
	11.4400
	11.2200
	10.5200

Figure 14(b):

Operating Return to Equity (GM)

55	60.1100
	37.6400
	33.0600
	21.6100
	32.8100
	34.4300
	28.8600
	42.6000
	46.8300
	42.5700
	35.3200
	37.0500
	32.4600
	35.9400
	33.3600
	6.6000
	34.6400
	35.5300
	34.7400
	12.1400
	18.2000
	37.6600
	39.1300
	37.9200

Figure 14(c):

Operating Return to Plant and Equipment (GM)

55 108.730
58.090
52.000
36.530
62.090
66.500
57.340
98.250
110.200
94.440
97.410
69.560
62.630
71.660
66.410
12.010
67.970
75.780
76.980
24.490
37.150
85.570
85.830
77.220
79 45.390

Figure 14(d):

Operating Return on Assets (GM)

55 40.3000
26.2400
23.7600
15.7200
24.3100
25.5400
21.0000
30.8800
34.6000
31.4100
35.3200
26.4600
22.6600
25.0200
23.0000
4.5600
20.5300
22.7000
21.5000
7.4300
11.0500
22.0800
23.1000
21.7300
79 14.9000

Figure 14(e):

Net Return on Sales (GM)

55 9.5600
7.8500
7.6800
6.6500
7.7700
7.5300
7.8300
9.9600
9.6500
10.2100
10.2500
8.8700
8.1300
7.6100
7.0400
3.2500
6.8500
7.1000
6.7000
3.0100
3.5100
6.1300
6.0700
5.5400
79 4.3600

Figure 14(f):

Net Return on Plant and Equipment (GM)

55 50.5500
28.5500
27.0500
21.3500
30.7700
31.8500
29.4400
50.6000
52.5900
50.6400
51.0500
38.5800
33.9000
35.3900
33.3000
11.2500
35.1400
39.4800
42.2800
15.2900
19.5500
45.8500
46.4400
40.6600
79 27.3400

Figure 14(g):

Net Return on Equity (GM)

55 27.9500
18.5000
17.2000
12.6300
16.2600
16.4900
14.8200
21.9400
22.3500
22.8300
18.5100
20.5500
17.5700
17.7500
16.7300
6.1800
17.9100
18.5100
19.0800
7.5800
9.5800
20.1800
21.1700
19.9700
79 15.0800

Figure 14(h):

Net Return on Assets (GM)

55 18.7500
12.9000
12.3600
9.2000
12.0500
12.2400
10.7900
15.9100
16.5100
16.8500
13.4700
14.6800
12.2600
12.3600
11.5400
4.3000
10.6100
11.8400
11.8200
4.6400
5.8100
11.8800
12.5200
11.4600
79 8.9800

Figure 14(i):

Operating Income (GM)

55 2558.40
1724.00
1622.40
1083.50
1761.40
2000.60
1737.80
2831.90
3335.50
3236.50
4055.80
3230.30
3007.00
3505.60
3411.00
651.00
3745.60
4149.20
4372.30
1516.30
2383.20
5398.40
6155.70
6653.30
79 4799.70

Figure 14(j):

Net Income (GM)

55 1189.50
847.40
843.60
633.60
873.10
959.00
892.80
1459.10
1591.80
1734.80
2125.60
1793.40
1627.30
1731.90
1710.70
609.10
1935.70
2162.80
2398.10
950.00
1253.10
2902.80
3337.50
3508.00
79 2892.70

Figure 14(k):

Net Income in Constant Dollars (GM)

55	1483.17
	1041.03
	1000.71
	731.64
	1000.11
	1081.17
	996.43
	1610.49
	1735.88
	1867.38
	2249.31
	1845.06
	1627.30
	1662.09
	1550.01
	625.73
	1595.80
	1726.10
	1801.73
	643.20
	777.36
	1702.52
	1838.84
	1795.29
79	1330.59

Figure 15(a):

Operating Return to Sales (Ford)

55	16.6100
	9.5200
	9.2400
	8.1000
	14.2200
	12.4800
	12.2000
	12.4500
	11.7600
	10.1900
	11.1200
	9.4600
	1.4200
	9.0800
	7.5200
	6.7700
	7.7100
	8.0100
	6.8200
	2.5700
	1.8200
	5.5000
	7.2600
	5.5200
79	2.1100

Figure 15(b):

Operating Return to Equity (Ford)

55	46.5500
	20.8100
	23.1900
	14.4700
	29.1100
	22.7000
	26.1800
	29.4700
	27.6400
	24.5700
	28.5800
	24.2200
	3.2500
	25.8500
	21.2800
	18.5600
	22.8200
	27.1200
	24.4900
	10.6900
	6.8500
	22.1800
	32.4900
	24.3400
79	8.8000

Figure 15(c):

Operating Return to Plant and Equipment (Ford)

55	77.9300
	26.2500
	28.9500
	20.0100
	49.6300
	43.1800
	39.0400
	47.0600
	45.0400
	38.1100
	42.4800
	33.6800
	3.8900
	32.2300
	27.0000
	23.4200
	28.0600
	34.1200
	30.2300
	10.6800
	7.8400
	28.4300
	44.2600
	31.8500
79	9.9500

Figure 15(d):

Operating Return on Assets (Ford)

55	34.2500
	15.0900
	16.3300
	10.6900
	22.0400
	8.9800
	15.9800
	18.5500
	17.2900
	15.2900
	16.9000
	14.2800
	1.8700
	14.2600
	12.0300
	10.2200
	12.0300
	13.9400
	12.1200
	4.2800
	3.2900
	10.0600
	14.2800
	10.6900
79	3.9000

Figure 15(e):

Net Return on Sales (Ford)

55	8.12000
	5.34000
	5.09000
	2.81000
	8.43000
	8.17000
	6.10000
	5.94000
	5.59000
	5.23000
	6.09000
	5.07000
	0.80000
	4.45000
	3.70000
	3.44000
	4.00000
	4.31000
	3.94000
	1.39000
	1.35000
	3.40000
	4.42000
	3.72000
79	2.69000

Figure 15(f):

Net Return on Plant and Equipment (Ford)

55	38.0900
	14.7200
	15.9600
	6.9400
	29.4200
	28.2700
	19.5200
	22.4500
	21.4100
	19.5600
	23.2600
	18.0500
	2.1900
	15.8000
	13.2800
	11.9000
	14.5600
	18.3600
	17.4500
	5.7800
	5.8200
	17.5800
	26.9400
	21.4600
79	12.6900

Figure 15(g):

Net Return on Equity (Ford)

55	22.7500
	11.6700
	12.7800
	5.0200
	17.2600
	14.8600
	13.0900
	14.0600
	13.1400
	12.6100
	15.6500
	12.9800
	1.8300
	12.6700
	10.4700
	9.4300
	11.8400
	14.5900
	14.1500
	5.7800
	5.0800
	13.7100
	19.7800
	16.4000
79	11.2200

Figure 15(h):

Net Return on Assets (Ford)

55	16.7400
	8.4600
	9.0000
	3.7100
	13.0400
	11.3900
	8.0000
	8.8700
	8.1200
	7.8300
	9.2500
	7.6800
	1.0600
	7.0000
	5.9400
	5.2100
	6.2500
	7.4800
	7.0000
	2.5500
	2.3000
	6.2300
	8.6900
	7.1900
79	4.9700

Figure 15(i):

Operating Income (Ford)

55	929.30
	442.60
	533.40
	128.20
	761.50
	653.80
	818.40
	1007.10
	1028.20
	985.80
	1282.50
	1157.50
	171.90
	1278.90
	1110.00
	1014.80
	1267.40
	1617.90
	1553.80
	605.20
	436.40
	1586.90
	2745.60
	2358.50
79	917.00

Figure 15(j):

Net Income (Ford)

55	454.10
	248.20
	294.00
	116.20
	451.40
	427.90
	409.60
	480.70
	488.50
	505.60
	703.10
	621.00
	84.10
	626.60
	546.50
	515.70
	656.70
	870.00
	906.50
	327.10
	322.70
	983.10
	1672.80
	1588.90
79	1169.30

Figure 15(k):

Net Income in Constant Dollars (Ford)

55	566.209
	304.914
	348.754
	134.180
	517.068
	482.412
	457.143
	530.574
	532.715
	544.241
	744.021
	638.889
	84.100
	601.344
	497.723
	443.422
	541.385
	694.333
	681.067
	221.462
	200.186
	576.598
	921.653
	813.152
79	537.856

Figure 17:

Imported Cars Market Share

58	9.1900
	10.6800
	6.2400
	4.8100
	5.1400
	5.0800
	6.2400
	6.1000
	9.0100
	7.2000
	10.7000
	11.7000
	15.3000
	15.3000
	14.8000
	15.4000
	15.9000
	18.4000
	14.8000
	18.6000
	17.7000
79	21.8000

Figure 18:

New Car Price Index over Producer Price Index (Automobile Industry)

55	1.05330
	1.02522
	1.03470
	1.03466
	1.05583
	1.05769
	1.05984
	1.05578
	1.05828
	1.04985
	1.02437
	1.00507
	1.00000
	1.00000
	0.99618
	0.98988
	0.97476
	0.94068
	0.93205
	0.90944
	0.88243
	0.88231
	0.87294
	0.87386
79	0.87139

Figure 22(a):

Plant and Equipment per Employee (GM)

55	6.9782
	8.7981
	9.8016
	11.4302
	11.1012
	11.2025
	12.6669
	11.8852
	11.9633
	12.6994
	12.9683
	14.1224
	15.4274
	15.6923
	15.9972
	19.4625
	18.4174
	19.4656
	19.2575
	22.9030
	25.7028
	24.3210
	24.9196
	26.2837
79	29.1669

Figure 22(b):

Plant and Equipment over Payroll and Benefits (GM)

55	1.37259
	1.79625
	1.92800
	2.19689
	1.98218
	1.88952
	2.13887
	1.82268
	1.75426
	1.80655
	1.72948
	1.87590
	1.97684
	1.80260
	1.81996
	2.16395
	1.76682
	1.69589
	1.50683
	1.71943
	1.74266
	1.40176
	1.29380
	1.27622
79	1.31520

Figure 23(a):

Plant and Equipment per Employee (Ford)

55	6.5208
	8.7665
	9.4601
	11.3085
	10.2346
	10.0692
	14.2892
	13.1210
	13.4829
	14.0469
	14.5926
	15.2611
	16.7225
	16.6942
	16.9403
	18.1913
	17.6841
	18.5544
	18.6310
	20.3925
	23.0123
	23.0841
	23.1930
	24.5694
79	28.8401

Figure 23(b):

Plant and Equipment over Payroll and Benefits (Ford)

55	1.23380
	1.71481
	1.75519
	2.13709
	1.73182
	1.70382
	2.37384
	2.09442
	2.07098
	2.02430
	1.91987
	1.98628
	2.33927
	1.95251
	1.97641
	2.03282
	1.76036
	1.55487
	1.43323
	1.50949
	1.63614
	1.42135
	1.22138
	1.18634
79	1.29637

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